Bank Liquidity Creation:

A New Global Dataset for Developing and Emerging Countries

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ABSTRACT

The pre-Global Financial Crisis build-up, followed by the post-crisis collapse, in bank liquidity creation in developed countries is well-documented (Berger and Bowman, 2009). Comparable analyses on developing and emerging countries (DECs) have been severely hindered by the lack of detailed bank-by-bank balance sheet data. This paper proposes a new, high-frequency, *Aggregate Bank Liquidity Creation* (A-BLC) measure for 114 DECs on a comparable cross-country basis, which relies on macroeconomic, country-wide, banking systems' balance sheet data. The A-BLC database allows us to assess the extent of bank fragility arising from illiquidity associated with intermediation at the banking system level for every DEC, at a monthly frequency over the period 2001-2016. Our measure captures more accurately than other measures proposed in the literature the evolution of bank liquidity creation in the DECs. Stylised facts and panel-regression analysis suggest a sharp pre-crisis build-up and post-crisis fall in liquidity creation in DECs, larger then that observed for developed countries. In addition, financial depth and stability appear as particularly important drivers of A-BLC in DECs.

Keywords: Developing and emerging countries; bank liquidity creation; financial fragility.

JEL classification: O16; E44; F30; G2; G21;

Acknowledgements

The authors thank an anonymous referee, as well as the editor of the Journal, for remarks which helped us improve the paper. The second author acknowledges support the French National Research Agency Grant ANR-17-EURE-0020, and the Excellence Initiative of Aix-Marseille University - A*MIDEX.

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1. Introduction

The pre- Global Financial Crisis (GFC) build-up and subsequent post-crisis collapse in banking liquidity creation in developed countries is well-documented in the literature (among many: Berger and Bouwman, 2009; Rauch et al., 2011; Morelli et al., 2013). The data-rich environment of OECD countries has, indeed, allowed researchers to monitor the transformation of liquid liabilities into illiquid assets in such countries over time on a bank-by-bank basis. By contrast, the lack of comprehensive and homogenous disaggregated bank balance sheet data in developing and emerging countries (DECs) prevents the monitoring and comparative assessment of local financial instabilities and potential regional cross-border spill-overs. Still, instabilities arising from excessive bank liquidity creation in DECs might be particularly severe due to the dominance of banks in their financial systems and to the highly interconnected nature of banks across borders, rendering DECs particularly prone to inter-regional systemic contagion.

This paper has three objectives. First we propose the construction of a new high-frequency *aggregate* bank liquidity creation (A-BLC) measure for 114 developing and emerging countries on a comparable cross-country basis over one-and-a-half decades, at the macro level, in the same spirit as the micro metrics proposed by Berger and Bouwman (2009). Second, we aim at documenting that our composite A-BLC measure of liquidity creation, via the transformation of liquid liabilities into illiquid assets, is more comprehensive than, and outperforms, standard liquidity (credit-to-GDP or loans-to-deposit) ratios as it embodies many other balance sheet items in only one metric. The third objective will be to establish, with both descriptive analysis and panel estimates, the stylized facts about the pattern of bank liquidity creation across DECs and identify the country characteristics with which it is associated.

The proposed A-BLC database can have a wide scope of applicability in empirical studies. Most notably, our proposed measure can be used in cross-country studies dealing with the international transmission of shocks, a theme which is particularly relevant for DECs. Moreover, this measure can also be used as a proxy for banks' *modus operandi* and tested against a variety of factors, such as changes in banking regulation or macroeconomic conditions. Furthermore, having a tool that allows us to monitor bank liquidity creation in DECs can allow us to better understand the drivers of banking crises in these regions. Emerging countries have, indeed, experienced a large number of banking crises in the last decades (Podpiera and Weill, 2008). Laeven and Valencia (2013) identify 147 systemic banking crises since 1970, most of which occurred in developing and emerging economies. Some driving factors are peculiar to developing and emerging economies, such as foreign capital inflows' volatility, while some features are shared with developed countries, most notably asset price bubble bursts and the build-up of mismatches on balance sheets (Goldstein and Turner, 1996). It is only relatively recently that a link between liquidity creation and banking crisis has been drawn in the literature. Diamond and Rajan (2001) and Kashyap et al. (2002), for instance, argue that the increase in

maturity mismatches, or in liquidity creation on banks' balance sheets, can be considered to be the major drivers of banking crises in the last few decades.

The theoretical literature on bank liquidity is vast (among many: Diamond and Rajan [2001, 2002, 2005] and Allen and Gale [2004]) and mainly focuses on repercussions on banks' default risk. The corresponding empirical literature is rather limited, essentially proposing different metrics to proxy the liquidity creation of banks. Most research has favoured a micro-level approach, focused on explaining banking crises at a country-by-country level with a series of bank-by-bank balance-sheet based metrics aimed at capturing different vulnerabilities that may arise within a given bank. In the US, for instance, Berger and Bouwman (2009) constructed a bank-level measure of liquidity creation for all U.S. banks, which was subsequently replicated for Germany (Rauch et al. [2011]), the Czech Republic (Horvath et al. [2014, 2016]) and Russia (Fungáčová and Weill [2012] and Fungáčová et al. [2015]). For such data-rich countries, this bank-level liquidity-creation measure is highly comprehensive, as it encompasses a large set of on- and off-balance sheet items and banks. Such a measure thus allows these authors to additionally assess the degree of liquidity creation of the whole banking system via aggregation in a bottom-up approach. By contrast, for data poor-countries, such as many DECs, a comprehensive assessment of the degree of micro, and thus aggregate, liquidity creation is hampered by limited data availability. In particular, the impossibility to measure macro liquidity creation, i.e. for the banking system of a given country as a whole, in a comparable way, across-countries (via a bottom-up approach), represents an important drawback for macro-prudential regulators who wish to monitor systemic risk at both the national, regional and global levels (Acharya and Thakor, 2016).

The contribution of this paper is the construction of a high frequency cross-country aggregate bank liquidity creation database for DECs which covers more than a hundred developing and emerging countries over a fifteen-year period. It is the first attempt to propose, at the macroeconomic level, a measure of bank liquidity creation, which to date has been exclusively based on the aggregation of bank-by-bank data, unfortunately only possible for OECD countries.

This database allows establishing three series of stylised facts considering different country classification methods, i.e. by geography, income, banking development and financial stability, in order to capture common patterns and specificities by country groups. The first stylized fact, over the full time sample, involves a hump-shaped relationship between *A-BLC*-to-Total-Assets and income levels or financial markets efficiency. The second lies in the positive relationship between bank liquidity creation and both bank access and financial market depth, as well as a negative link between A-BLC and financial market stability. The third involves two distinctive regimes in average aggregate bank liquidity creation in emerging and developing countries: pre- and post- 2008. Most remarkably, average aggregate liquidity creation by banks increased persistently up to mid-2008, before collapsing substantially, suggesting noteworthy spillovers from advanced countries to DECs via the banking systems before and during the GFC.

We carry out an econometric analysis, via a dynamic panel regression, in order to confirm these stylized facts. We document that bank liquidity creation in DECs increases with banking sector depth and falls with excess reserves on banks' balance sheets. We also uncover an overall inflection in post-crisis liquidity creation in non-offshore DECs. Lastly, we find evidence in support of the fact that an expansionary monetary policy in developed countries, in the US in particular, has stimulated banking liquidity creation in DECs, suggesting global liquidity spillovers from developed economies to DECs.

This paper relates to existing literature on the measurement of liquidity risks of banks using balance sheet data (see Matz and Neu [2006] for a survey). Compared to existing alternatives, such as bank credit or the (very volatile) liquidity-transformation gap, a ratio of the difference between liquid liabilities and assets scaled by total assets (proposed by Deep and Schaefer, (2004)), our aggregate bank liquidity creation measure proves better able to track the gradual pre-GFC build up and post-GFC scaling down in liquidity. Our Aggregate BLC measure is operational, while Brunnermeier et al.'s (2014) Liquidity Mismatch Index, also obtained as a weighted average of liquid assets and liabilities, has only a theoretical nature and its weights are not specified.

Our paper is also related to the literature on liquidity creation in DECs, which focuses mainly on emerging countries. For a sample of banks in BRICs countries Umar and Sun (2016) find a negative relationship between liquidity creation and funding liquidity, Umar et al. (2018) document that an increase in regulatory capital is associated with a fall bank liquidity creation, and Dahir et al. (2018) report that bank liquidity transformation, or liquidity risk, is associated with higher risk-taking. Bunda and Desquilbet (2008) investigate the relationship between exchange rate regimes and bank liquidity in emerging markets, finding that banks are less liquid when intermediate regimes are adopted. This paper departs from this literature in several regards. First, it enlarges the sample countries to all DECs. Furthermore, we investigate how liquidity creation varies across our sample countries according to banking sector development, which, as discussed in the contributions by Buch et al. (2010) and Beck et al. (2000), explains structural cross-country differences in loan provision and thus liquidity creation.

The rest of the present paper will be structured as follows. Section 2 first briefly reviews the literature on bank liquidity creation both from a theoretical and an empirical standpoint, and then discusses the benefits of an aggregate measure of liquidity creation, comparable across countries and available on a monthly basis. Section 3 details the construction of A-BLC and proposes a set of descriptive statistics, both from a univariate and a dynamic viewpoint, to establish stylized facts. Section 4 presents the panel data econometric analysis and Section 5 concludes.

2. Bank liquidity creation

2.1 Disaggregated measures and the arguments supporting a macro approach

Bank liquidity creation, which refers to the transformation of liquid liabilities into illiquid assets, is typically measured in developed countries on a bank-level basis, often using detailed balance-sheet data. The importance of monitoring its development is widely accepted by the existing literature which recognises that liquidity creation is the fundamental role of financial intermediaries, exposing them inherently to liquidity and default risks (Diamond and Dybvig, 1983; Diamond and Rajan (2001, 2002, 2005); Allen and Gale (2004)).

Although liquidity creation is widely modelled in a single-bank context, some theoretical literature recognises the importance of monitoring excessive liquidity creation of the banking system as a whole. Holmström and Tirole (1998) and Caballero and Krishnamurthy (2001) examine aggregate liquidity form a macro-prudential standpoint, showing that the private sector often creates excessive liquidity beyond the socially-optimal level. These works stress that an aggregate measure of liquidity creation across the financial sector can help macro-prudential regulators to better monitor macroeconomic risk. Indeed, as argued by Acharya and Thakor (2016), liquidity creation by banks should be a concern of both micro-prudential and macro-prudential regulators, providing them grounds for cooperation. They show that liquidity creation by banks, which is a micro-prudential regulation concern, is tightly linked to systemic risk and macro-prudential policies whenever liquidity creation is leverage-based. In addition, Brunnermeier et al. (2014) propose a formal model of bank liquidity creation from which stems a Liquidity Mismatch Index[3] (LDI), a theoretical metric which measures the liquidity creation of banks both at the micro and at the macro levels, and embodies information on both on- and off-balance sheet commitments of banks as well as financial market prices. Such a LDI is obtained as a weighted average of liquid assets and liabilities. However, given the theoretical nature of the metric, the weights are not specified. Although some of these theoretical contributions highlight the desirability of computing and monitoring liquidity creation at the aggregate or macro level, empirical applications focus exclusively on its micro dimension, and a bottom-up approach.

One of the main challenges faced by empirical researchers aiming to calculate bank-level liquidity creation has been the choice of a suitable measure. The most refined measure of liquidity creation was introduced by Berger and Bouwman (2009), thereafter B&B, who propose a comprehensive method for calculating the transformation of liquid liabilities into illiquid assets of banks, taking into account both on- and off-balance sheet commitments[4]. They introduced four different

[3] The Liquidity Mismatch Index can be constructed using balance sheet data calculating the cash equivalent value of the bank at each point in time under some assumptions. The metric is computed by using different liquidity weights for both asset and liabilities items. See Bai et al. (2016) for an empirical application of this measure.

[4]Bank liquidity creation is also interconnected with other measures of financial liquidity, most notably funding liquidity as described by Nikolaou (2009) and Brunnermeier and Pedersen (2009). A higher degree of liquidity

measures of liquidity creation, which stem from different balance-sheet classifications (on- and off-balance sheet and liquidity defined by category and by maturity). Their findings point to a massive escalation of bank liquidity creation by US banks over the period 1993-2003, doubling in real terms to reach in excess of $2.8 trillion in 2003. Prior to this work, a large number of empirical applications proposed less comprehensive measures in which private credit was often used as a proxy for bank liquidity creation (among others: Kaminsky and Reinhart [1999] and Demirgüç-Kunt and Detragiache [1998])[5]. A less refined proxy than the B&B measure is the liquidity-transformation gap or *LT gap*, computed as the difference between liquid liabilities and assets scaled by total assets, as proposed by Deep and Schaefer (2004). This measure considers all assets and liabilities with a maturity less than one year, regardless of the type of balance sheet item considered; a positive metric signals an important increase in bank liquidity creation. According to the LT gap, US banks generated an astonishingly low liquidity creation over the years 1997-2001, in contrast with the results found by B&B (2009). This can be explained by the fact that the LT gap does not account for the use of liquid liabilities, most notably of long-term loans, which expanded massively in the US. The measure of bank liquidity creation proposed by B&B can however be considered as the most accurate measure of liquidity creation as it takes into account all balance sheet items. Indeed, it accounts in particular for those items which are considered as liquidity destroying. By contrast, simple measures of private sector debt, or bank credit, do not account for the full liability structure of the banks' balance sheet or the structure of liquid assets held by banks, preventing the analyst to draw any conclusion on the overall liquidity of banks. Also, measures that focus entirely on liquidity flows, such as the LT gap, are quite volatile and disregard other items of the balance sheet that contain useful information on banking fragility, such as safe assets or market depth of other financial instruments on the balance sheet.

The major drawback of the B&B measure of bank liquidity creation is that it requires detailed balance-sheet data, limiting the scope of its application. This is especially true for those DECs which have relatively less comprehensive data on banks' activities and rather limited coverage of the banking population. The empirical literature to date indeed proposes empirical studies which apply the B&B methodology using data on developed countries. Horvath et al. (2014, 2016) use bank-level data of Czech banks and assess the relationship between liquidity creation, capital and competition. They find that while higher competition is associated with lower levels of liquidity creation by banks, capital requirements under Basel III have a negative effect on liquidity creation by banks and a rise in BLC increases default risk. Fungáčová et al. (2015) confirm such a positive relationship between bank liquidity creation and default risk using bank-level data for Russian banks. Rauch et al. (2011) investigate the drivers of bank liquidity creation using data of German savings banks. They find that, among the macroeconomic factors, monetary policy has a key role while bank-specific characteristics

creation by a bank, associated with the holding of more illiquid assets and/or liquid liabilities, exposes the financial institution to higher funding-liquidity risk.

[5] See Fungáčová et al. (2015) and references therein.

cannot significantly explain differences in liquidity creation across banks. Pana et al. (2010) using US banking data find that bank mergers have a significant and positive impact on liquidity creation. Morelli et al. (*2013*) propose a slightly modified version of the B&B liquidity-creation metrics for Euro Area banks, in which the weights are adjusted according to the maturity of the financial assets and of the counterparty sector. They find asymmetrical patterns of their liquidity creation measure with higher growth rates in peripheral than central euro-zone countries over the period 2003-2008. Distinguin et al. (2013) are the first to apply B&B's bank liquidity creation measure across banks in an international context with the aim to establishing a relationship with capital buffers. They consider over 700 US and European banks and find that high levels of liquidity creation are associated with lower capital buffers. The above-mentioned studies generally use annual data, except for Fungáčová et al. (2015) and Morelli et al. (*2013*) who use quarterly and monthly data respectively.

2.2 Liquidity Creation: A focus on Emerging and developing countries

Research on banking liquidity creation in DECs has been growing in importance in the last few years. Most existing research on this topic has focused on Chinese banks using the B&B metric and has looked at the implications for capital ratios.

Xie (2016), using annual data for Chinese banks over the period 2004-2014, finds that higher capital requirements do not weaken bank liquidity creation. Lei and Song (2013), on the other hand, using the 1988-2009 sample period, show that bank capital is negatively related to the degree of bank liquidity creation in general, and the strength of this relationship varies with the type of bank ownership considered. Chen and Shen (2014) also find that excessive lending observed for Chinese banks in the last decade has increased the maturity mismatch and thus liquidity creation. Fu et al. (2015), extending the geographic coverage of the sample, and considering banks in 14 Asia-Pacific economies, uncover a negative relationship between BLC and capital requirements and stress that BLC is higher for large, and Asian, banks.

Research on banking liquidity creation in other developing regions is limited. Bank liquidity creation in Central American countries is expected to be relatively low given the high liquidity buffers held by resident banks. Indeed, Delechat et al. (2012) document that the liquid assets-to-deposit ratio in this region is significantly higher than in South American countries, mainly due to precautionary holdings and underdeveloped financial markets. A similar pattern is expected to be observed for African countries in which banks also tend to hold high levels of liquid assets albeit at different intra-regional degrees (Saxegaard, 2006; Nana and Samson, 2014). In addition, liquidity creation by banks located in Latin American countries is expected to be particularly vulnerable to external shocks given the high presence of foreign banks in the region and the currency mismatches on their balance sheets (Rojas-Suárez and Serena, 2015). This is further confirmed by Federico (2012) who, using a sample of developing and emerging Latin America and Caribbean banks, finds that external financial shocks have

more acute repercussions on those economies which feature higher liquidity risk of their banking systems.

2.3 Why an aggregate measure of bank liquidity creation is needed?

Bank liquidity creation has important implications for systemic risk in emerging and developing countries and can constitute a valuable early-warning monitoring tool for prudential regulators (Caballero and Krishnamurthy, 2001; Acharaya and Thakor, *2016*). However, existing bank-level metrics of liquidity creation account for banking fragility only from a micro-prudential perspective and have limited scope in assessing system-wide instabilities, which are, instead, of interest to macro-prudential regulatory bodies. Moreover, the interconnections established by banks across borders via borrowing from, and lending to, foreign financial institutions and via the operations of affiliates in foreign countries, highlight the usefulness of an aggregate measure of liquidity creation comparable across jurisdictions.

A *bottom-up* approach, which constructs macro liquidity creation metrics from the aggregation of bank-level data for many countries, is not a feasible task for data-poor countries, i.e. many DECs. This is due to four fundamental reasons. Firstly, micro balance sheet data is not evenly available across such banks and countries, hindering the cross-country construction of a comparable composite measure of bank liquidity creation. Secondly, banking data available from commercial databases, such as Bankscope, covers large and medium-sized banks; the large presence of small banks in DECs would result in a distorted measure of aggregate liquidity creation, constructed with such a database, biased towards data available for large-sized banks. Thirdly, in terms of frequency, balance-sheet micro banking data is at best available on an annual basis, with uneven sample periods, preventing the construction of a high-frequency aggregate measure that can be monitored over time and used as an early-warning tool. Lastly, micro liquidity creation measures computed for data-rich countries, such as advanced economies, rely on very detailed and segmented balance sheet (and even off-balance sheet) items which are data-dependent and country-specific.

In order to overcome these data limitations we propose an *aggregate* measure of liquidity creation constructed directly at the macro level from standardised system-wide balance sheet items of the banking systems across countries, available on a monthly basis for a large sample of developing and emerging economies. The BIS (2011) has highlighted the need and the importance of having aggregate and comparable cross-country liquidity measures that are consistently constructed. In the case of liquidity created by the banking sector, in particular, the BIS proposes a 'Global Liquidity Creation' (GLC) measure largely based on credit or banks' claims (see BIS, 2019). Since GLC does not account for liquidity-reducing items, it may lead to an overestimation of the actual liquidity creation by the banking system. In addition, the aggregation of credit provision across countries implies that this GLC measure is mostly driven by developed countries which feature higher financial market development and thus more lending.

The *aggregate* measure of liquidity creation we propose is based on less refined balance sheet items than its disaggregated bank-level equivalent but has the advantage of being homogenously constructed across countries. It is a useful tool for monitoring for instance: (*i*) the dynamics and structural changes in banking systems' aggregate balance sheet and business models; (*ii*) banking sector fragility/stability (macro-prudential tool); (*iii*) and the cross-country relative degree of bank liquidity creation as well as global co-movements and transmissions of financial shocks.

Our proposed metric, namely the Aggregate Bank Liquidity Creation measure (A-BLC) is linear, ensuring that an aggregate measure of liquidity creation constructed using macro data exactly matches an equivalent measure using corresponding micro-level balance sheet items for all banks in a country as:

$$A - BLC_{i,t} = \sum_{k_i=1}^{K_i} A - BLC_{k_i,i,t} \quad (1)$$

where $\text{A-BLC}_{k_i,i,t}$ is the liquidity creation by a bank k, k=1,…, K_i, located in country *i* in period *t* with K_i capturing the fact that the number of banks is variable across countries, i.e. K_i varies across countries. A *bottom-up* approach from micro-data to macro-data is clearly infeasible when (1) has to be computed for a large set of countries when commercial databases do not provide comparable balance sheet items across banks in different countries for all institutions. As we will detail further in section 3 below, our A-BLC, constructed using aggregated data as in (1), allows us to obtain a high-frequency, accurate and comprehensive measure of banks' liquidity creation which is comparable on a cross-country basis.

3. The Aggregate Bank Liquidity Creation (A-BLC)

This section details the construction of our preferred aggregate measure of liquidity creation and presents some stylised facts focusing on both the cross-sectional and time series dimensions. Additionally, in the last sub-section, we carry out a comparative analysis with alternative measures proposed in the literature.

3.1. Construction and data quality

3.1.a A-BLC construction

We propose an aggregated measure of bank liquidity creation for 114 DECs as listed in Table A.1 in the Appendix, with a monthly frequency over a decade and a half, amounting to a total of 18,479 observations in the unbalanced panel. The A-BLC resembles, albeit on an aggregate basis, one of the four measures proposed by B&B: namely that which classifies balance-sheet items by category and excludes off-balance-sheet commitments[6]. The data used to construct the A-BLC measure is publicly

[6] The exclusion of off-balance sheet items is due to data unavailability and is not a worrisome limitation of our measure given limited dependence on off-balance sheet commitments in emerging and developing countries.

available from the International Financial Statistics (IFS) database by the International Monetary Fund[7] (IMF). The variables collected refer to balance sheet data in the 'Other Depository Corporation Survey', that is, deposit-taking banks other than the central bank, which we collect on a monthly basis from December 2001 to January 2016. Relatively less comprehensive data is available for China and India, which are included in the sample, in such a way that for them the A-BLC computation differs slightly from that of other countries. The details regarding the variables sources and codes can be found in the data Appendix (Table A.5 and Table A.6, respectively for DECs in general and the two large Asian countries in particular).

The construction of the A-BLC measure involves a two-step process. In a first step, we classify all the items (assets, liabilities, and equity) from the country-wide balance-sheet according to their liquidity (i.e. liquid, semi-liquid or illiquid). The stylised balance-sheet has the format reported in Table 1.

A weight is attached to each class of activity according to the traditional definition of liquidity creation *à la* Diamond and Dybvig (1983): banks create liquidity when they invest in illiquid assets from liquid sources of funding. Thus, a positive weight of *one-half* is attributed to those balance-sheet items which fall into the category of both illiquid assets and liquid liabilities, as in B&B. A weight of the same magnitude but of opposite sign is given to liquid assets and illiquid liabilities (i.e. they are netted out), since such items do not contribute to balance-sheet vulnerability and annihilate liquidity creation. Semi-liquid items on either side of the balance sheet are given a weight of *zero*.

The use of alternative weights has been discussed by Distinguin et al. (2013). In particular, the latter authors, using detailed maturity data on loans and deposits of European and US banks, are able to attribute weights larger than 0.5 to longer-term loans and shorter-term deposits (0.7 and 0.85, respectively). Focusing on the effect of regulatory capital on liquidity creation, Distinguin et al (2013) show that the banking liquidity creation measure using these modified weights yields comparable magnitudes than the measure using the Berger and Bouwman (2009) weights. A more accurate calibration of weights based on maturity is not possible with the IFS data, as this does not provide a maturity breakdown for the available balance sheet items.

[7] https://data.imf.org/?sk=4c514d48-b6ba-49ed-8ab9-52b0c1a0179b

Table 1: IFS Stylised banks' balance sheet

Assets	Liquid	Illiquid	Semi-Liquid
Weight	***-0.5***	***0.5***	***0***
Claims on Central Bank			
Currency	x		
Other Claims on Central Bank	x		
Reserve Deposits And Securities other than Shares	x		
Claims on Other Sectors			
on Other Financial Corporations	x		
on Private Sector		x	
on Public Non-financial Corporations			x
on State and Local Government			x
Liabilities and capital	**Liquid**	**Illiquid**	**Semi-Liquid**
Weight	***0.5***	***-0.5***	*0*
Transferable Deposits Included In Broad Money	x		
Other Deposits Included In Broad Money			x
Deposits Excluded from Broad Money			x
Financial Derivatives	x		
Insurance Technical Reserves			x
Liabilities to Central Bank	x		
Securities other than Shares Excluded from Broad Money		x	
Securities other than Shares Included In Broad Money	x		
Shares and other Equity		x	
Total Gross Assets			

Notes: Balance sheet items' identification follows the International Financial Statistics (IFS) database classification (IMF). This Table excludes net items, as listed in Table A.5 in the Appendix, which are given a weight equal to zero.

The A-BLC measure is then constructed according to formula (1) in the following way:

$$A\text{-}BLC_{it} = 0.5(Assets_{illiquid})_{it} + 0(Assets_{semi\text{-}liquid})_{it} - 0.5(Assets_{liquid})_{it} + 0.5\,(Liabilities_{liquid})_{it} + 0(Liabilities_{semi\text{-}liquid})_{it} - 0.5(Liabilities_{illiquid})_{it} \quad (2)$$

where t, t = 1, ..., T is the time subscript and i, i = 1, ..., N is the country index. The A-BLC measure is, therefore, an aggregate composite measure of banks' liquidity creation which attributes positive weights to those balance-sheet items which are typically considered as being responsible for banking-sector fragility.

3.1.b Data Quality

The IFS statistics data base is one of IMF's key datasets containing a large set of financial, monetary and macro indicators for most of the Funds' members. A large number of academic papers have relied on IFS data when dealing with DECs (among many: Chinn and Prasad, 2003; Lane and Milesi-Ferretti, 2001). Member countries cooperate with the IMF by providing detailed data to the IMF statistics Department (STA) which, in turn, transforms the collected data in order to have monthly cross-country harmonized series whenever applicable. All the series available on 'other depository

corporations' (ODCs), which we rely upon for our A-BLC computation, in particular, are transformed and harmonized by the STA in order to ensure cross-country comparability (IFS Annex I). To this end, banks and other deposit-taking institutions are required to report balance sheet items to the IMF using a standardized reporting form, in which all entries have to adhere to the IMF specific instructions. In practice, national central banks will ensure proper training of ODCs' reporting staff, providing technical support whenever needed. The national central bank acts as an intermediary between the IMF and ODCs as standardized data is submitted by depository institutions to central banks which in turn transmit the data to the STA. The IMF requires *all* ODCs operating in a country to report their standardized balance sheet positions. While a first stage of internal or within country harmonization is made by the national central bank, the STA staff carries out further transformations whenever necessary to ensure cross-country harmonization of source data, valuation principles and methodological consistency across different datasets. STA staff may also be involved in the aggregation, consolidation and netting of reporting data (see IMF manual for details).

In order to ensure the quality of the data submitted by reporting countries to the IMF, a Data Quality Assessment Framework guarantees an on-going comprehensive monitoring of data quality, taking into account most notably institutional factors and statistical procedures of the reporting country (see DQAF report). As discussed by Jerven (2016), in order to address concerns about lower-quality data reported by low-income countries, the IMF complements the reported data submitted to the STA with on-site surveillance in reporting countries. These missions to member countries allow the Funf to evaluate the data quality submitted to it, correct possible discrepancies/gaps and keep a constant flow of communication with the member countries' statistical officers.

For DEC countries there are not alternative sources to allow cross-country comparability. Gathering aggregate statistical data of banks' balance sheets from official sources is challenging, mainly due to differences in items' definition and availability. Calculating an aggregate banking liquidity creation measure using granular banking data available from commercial providers is not feasible, primarily due to partial-sample problems and the very uneven temporal availability of the balance sheet items for the relevant depositary institutions[8].

3.2. A-BLC measure: Descriptive analysis

a. Cross-section analysis

It is standard in the literature to consider liquidity creation in relation to gross total assets (see for instance Berger and Bouwman, 2009). In our case, considering the ratio *A-BLC* to total assets (TA) rather than, say, GDP is an obvious choice given the fact that GDP data is only available on a yearly

[8] This point is further discussed in Supplementary Information 1.

basis for most countries in the sample while TA is available on a monthly basis from the IFS, and industrial output is not widely available either for most countries at a monthly frequency. Besides, deflating by total assets does not require the conversion of the A-BLC metric from local to a common currency (i.e. US Dollar) as TA are also expressed in local currency; this overcomes the potential biases in a metric dependent on exchange rate fluctuations.

Table A.2 (Appendix) reports some descriptive statistics of *A-BLC*-to-TA by country over the whole sample, pointing to important cross-country average levels and variations in our metric. The largest mean *A-BLC*-to-TA is depicted by China, Anguilla and Burundi with the metric exceeding 0.4. Together with some Latin American countries, such as Chile, Costa Rica and Colombia, these same countries feature also the largest observed medians. Among the countries with the largest average volatility in the metric, as measured by the range (maximum minus minimum values), are found Iraq, Bhutan, Equatorial Guinea, Chile and Venezuela. All these countries experience large variations in A-BLC which exceed 30% of total assets. At the other end of the spectrum, among the countries with the lowest average degree of liquidity creation, amounting to less than 10% of total assets, can be found: Brazil, Algeria and Cambodia.

Table A.3 reports descriptive statistics by country, income and banking sector development levels, using a number of classification criteria. Firstly, countries are grouped by geographical clusters as classified by the Bank for International Settlements within the locational banking statistical framework (BIS, 2015). Non-developed countries are grouped into five geographical sets: Developing Europe, Developing Latin America and Caribbean, Developing Africa and Middle East, Developing Asia and Pacific and Offshore. Secondly, countries are classified by GDP per capita (y) as available from the World Bank[9] and are grouped into four classes: high income (y>$8000), medium-high income ($7999<y<$3000), medium-low income ($2999<y<$1000) and low income (y<$1000)[10]. The last two groups are considered by the World Bank as developing countries. Lastly, countries are grouped according to banking sector development as measured by four features: access, depth, efficiency and stability. The corresponding proxies are obtained from the World Bank Global Financial Development database[11]. *Access* is proxied by bank branches per 100,000 adults, *depth* by private credit granted by deposit money banks over GDP (%), *efficiency* by the interest rate spread (lending rate minus borrowing rate) and *stability* by the ratio of bank nonperforming loans to gross loans (%).

Overall, descriptive statistics reveal that Latin American, Caribbean and intermediate-level income countries depict the largest (average) degree of banking liquidity creation with the lowest volatility. Also, banking sector development is positively related to banking liquidity creation. With respect to the mean, the different groupings imply quite contrasted relationships between *A-BLC*-to-TA

[9] World Development Indicators data base: https://databank.worldbank.org/source/world-development-indicators
[10] GDP per capita calculations are based on the averages over the period 2001-2013
[11] https://www.worldbank.org/en/publication/gfdr/data/global-financial-development-database

and characteristics. Geographically, there is no difference across regions. However, there is a hump-shaped relationship between *A-BLC*-to-TA and income levels. With respect to banking sector characteristics, *A-BLC*-to-TA has a hump-shaped relationship with efficiency, as well as a positive relationship with access, depth and stability. In a similar manner, volatility of A-BLC-to-TA, as measured by the range, shows quite contrasted patterns. First, on a geographical basis, maximum volatility is experienced by both Asia and Africa, and minimum volatility by Europe, while Latin America stands in the middle. Moreover, while volatility of A-BLC is inversely related to the income level, distinctive patterns can be observed with respect to its relation with banking sector characteristics. That is, volatility of *A-BLC*-to-TA is inversely related to bank access, has a hump-shaped relationship with depth and stability and a U-shaped relationship with efficiency.

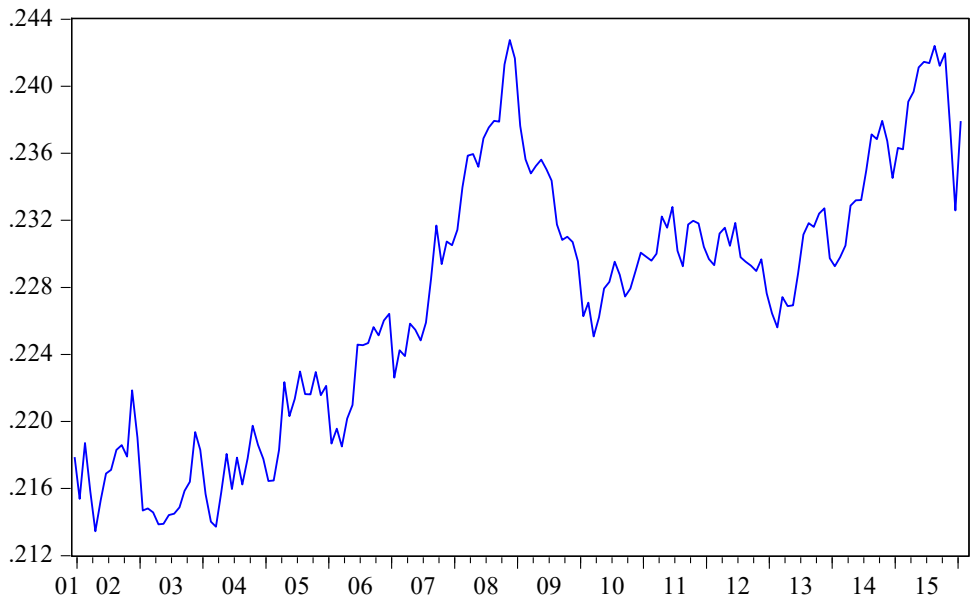
Table A.4 shows pairwise correlation coefficients between average A-BLC-to-TA and a set of proxies for banking sector development. Overall, correlations coefficients unveil some interesting insights on the relationship between bank liquidity creation and banking sector development, in line with our previous results. Most notably, the correlation between A-BLC-to-TA and banking sector depth, is positive and significant as expected. Albeit the correlation between liquidity creation and access, though positive, is rather low and close to zero (equal to 0.007). Banking sector efficiency depicts a negative correlation with bank liquidity creation, with a small coefficient in absolute value. Bank liquidity creation is negatively related to financial instability, as proxied by the 'percentage of nonperforming loans in the banks' loan books' (*stability (a)* in the Table 4). We also consider an additional proxy for banking sector stability, reserves-to-total assets (*stability (b)* in Table 4), that is available for a larger numbers of countries in our sample. Also in this case, the correlation coefficient is negative.

We next complement the correlation coefficient analysis with country-level information on the relationship between bank liquidity creation and banking sector development or income levels, in order to capture outlier countries and to have a full picture of cross-country variations. Figure A.1 in the Appendix reports scatterplots illustrating the relationship between A-BLC-to-TA and banking sector development proxies (depth, access, efficiency and stability) or income levels. Overall, countries with low banking sector development depict dissimilar patterns in the relationship between banking development and bank liquidity creation. Countries with high banking sector development are typically clustered into those in which the relationship with bank liquidity creation is positive and those for which it is negative. Countries with particular high access, as proxied by the number of bank branches per 100,000 inhabitants, have a positive correlation coefficient, with the exception of Bulgaria. Banking sector efficiency does not have a clear-cut relationship with bank liquidity creation. Lastly, China is the country which stands out for the highest correlation between depth and bank liquidity creation.

b. Time-series analysis: pre- and post-Global Financial Crisis dynamics

A descriptive time-series analysis of our aggregate bank liquidity measure suggests that on average there has been a recent build-up of fragility in the banking sector in DECs which may be still underway. Figure 1 shows the behaviour of A-BLC-to-TA, (arithmetically) averaged over all the 114 countries in the sample over the period December 2001-January 2016. Two distinct and successive regimes can be identified: 2001-2008 and post-2008. In the first regime average liquidity creation by banks in DECs increased persistently, up to mid-2008, before collapsing substantially and swiftly in just over one year, back to the level observed, previously, in early 2007. The timing of this hump-shaped movement of bank liquidity creation corresponds to that of the GFC, which thus seems to have had noteworthy *spillover* effects (both in the pre-crisis build up and post-crisis scaling down of liquidity) from advanced to developing and emerging countries via the banking systems. The significant dependence of banks in most DECs on global financial markets implies that the GFC indeed translated into a reversal in the ability of domestic banks to crate liquidity domestically. The second regime-period, following this collapse, depicts a slow recovery in bank liquidity creation over the period 2010-2013 before increasing at a fast pace, thus strikingly reaching, in mid-2015, levels observed during the 2008 peak, before collapsing marginally thereafter. As it will be argued shortly, further insights on the post-crisis behaviour of bank liquidity creation might be drawn from income-weighted A-BLC-to-TA.

Figure 1: Time series behaviour of Average A-BLC-to-TA



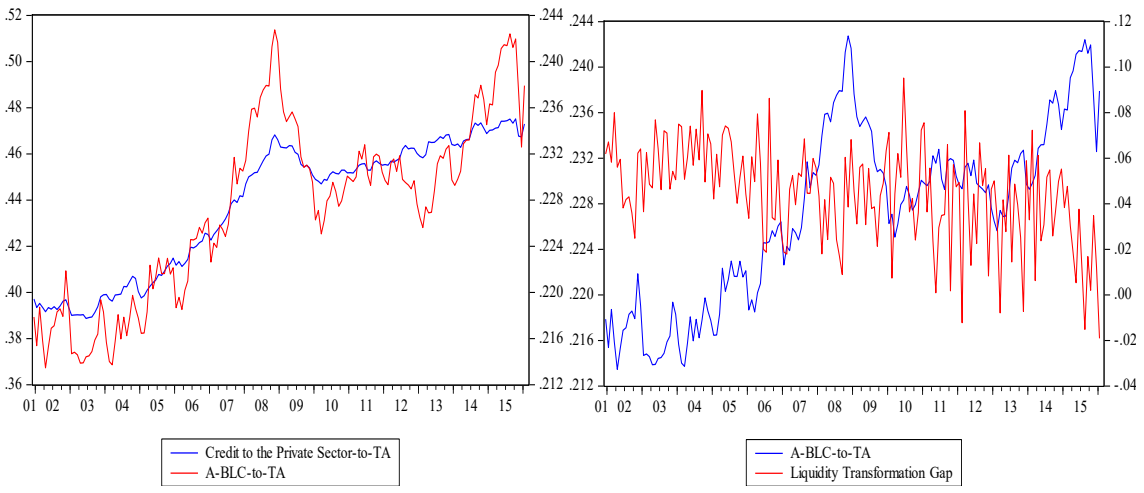
Sources: Authors' computations based on data from IFS.
Notes: Simple averages are computed across the 114 emerging and developing countries in the sample.

The comparison of our measure of bank liquidity creation (A-BLC-to-TA) with the other measures proposed in the literature, computed on an aggregate basis, shows that the former measure picks up more accurately than the latter the evolution of bank liquidity creation over the sample

considered for the DECs. Figure 2 shows how average A-BLC-to-TA relates to the (simple) average aggregate versions of 'claims of banks to the private sector to total assets' and the 'liquidity transformation gap'. For the sake of comparability, we construct these measures using balance-sheet variables available from IFS. Most notably, claims of banks on the private sector and gross total assets are directly available from IFS. The LT gap -equal to the difference between liquid assets and liabilities to total assets- is constructed using the following series: claims on central bank (liquid assets), claims on other financial institutions (liquid assets), and liabilities to central banks (liquid liabilities) and total deposits (liquid liabilities).

The left panel in Figure 2 reports the evolution overtime of A-BLC-to-TA and 'claims of banks to the private sector to total assets', *CB-to-TA*, both (arithmetically) averaged over all countries in the sample. Both measures depict a peak in mid-2008 with a subsequent collapse. Our A-BLC-to-TA measure, however, provides a more precise picture of the build-up in bank liquidity creation, which increased at a much faster rate than CB-to-TA up to mid-2008, carrying, thus, a more easily recognisable signal of banking fragility. Moreover, the subsequent collapse in bank liquidity creation is somewhat contained when looking at claims of banks to the private sector to total assets. In contrast, A-BLC-to-TA shows a clear reversal in bank liquidity creation, mirroring the increase observed before mid-2008, thus making it easier to identify reversals in banks' business model. The peak observed in 2015 in A-BLC-to-TA is not captured by CB-to-TA which, since late 2009, have been increasing at a slow pace. This can be explained by the fact that A-BLC takes into account extra variables on the asset side of banks' balance sheet as well as liability side variables, and weighs 'claims of banks on the private sector' as well as these other variables. Overall the CB-to-TA appears too smooth to provide accurate high-frequency information on risks represented by the build-up in bank liquidity creation.

Figure 2: Time series behaviour of A-BLC-to-TA versus other measures of liquidity creation, (simple averages across countries)

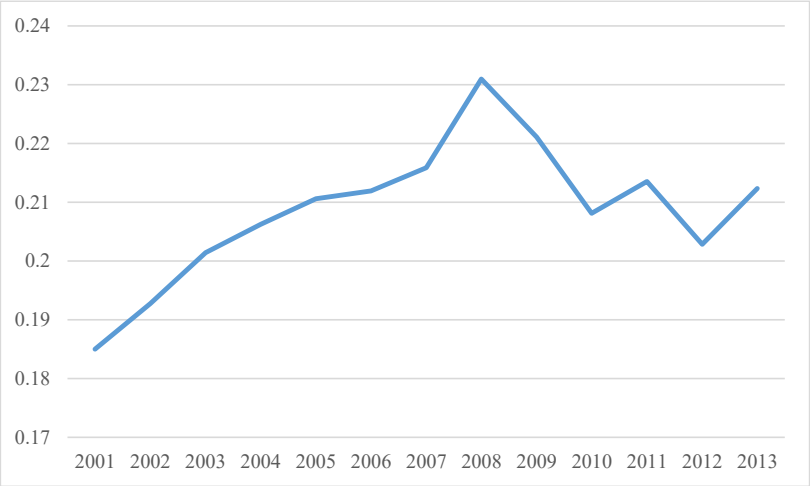


Sources: Authors' computations based on data from IFS.
Notes: Averages are computed across the 114 emerging and developing countries in the sample.

The right panel in Figure 2 shows aggregate average A-BLC-to-TA and the LT gap. The latter measure is highly volatile and is not at all able to capture the patterns in bank liquidity creation observed over time (especially the build-up before mid-2008) with the other measures. In other words the LT gap suffers from the opposite bias to that of CB-to-TA, i.e. it is too noisy instead of being too smooth.

To shed further light on the evidence presented in Figure 1, it is useful to look at average *aggregate* bank liquidity creation weighted by GDP per capita (and thus presented on an annual basis) rather than equally weighted. This can prove particularly informative for a better understanding of the dynamics in bank liquidity creation post-2008. Figure 3 confirms the persistent global rise in A-BLC, for the whole set of DECs, up to the 2008 GFC event, detected above with the unweighted average. However, post-crisis, the pattern of the GDP-per-capita-weighted A-BLC global measure sharply differs from that of the unweighted one, in as much as the former implies a gradual decline in bank liquidity creation as opposed to the fall, stabilization, and subsequent sharp expansion in the simple average measure.

Figure 3. GDP per capita-weighted A-BLC-to-TA



Sources: Authors' computations based on data from IFS and the World Bank.

Table 2 reports country rankings by mean A-BLC-to-TA over the pre- and post-crisis sub-periods as well as for the whole sample and for the 2007-2008 crisis sub-period. A few countries are systemically among the top-20 in the ranking of A-BLC-to-TA in all subsamples: China, Burundi, Pakistan, Costa Rica, Anguilla, Belize, Colombia, South Africa, Morocco, Fiji, India, Kosovo and Ukraine. A comparison of the second and fourth top panels of Table 2 shows that Namibia, Bolivia, the Central African Republic, Afghanistan, the Dominican Republic and Bangladesh were ranked among the top-20 exclusively before the crisis (2002-2006 period). On the other hand, Chile, Paraguay, Poland, Suriname, Chad and the Democratic Republic of Congo appear among the top-performers only in the post-crisis period. In particular, the post-crisis ranking features a notable catch up in bank liquidity

creation for Chile and Venezuela; especially for the former country which did not appear in the pre-crisis top-20 ranking.

Table 2: Mean A-BLC-to-Total Assets by sub-periods, country rankings

Top 20 Countries: Mean A-BLC-to-TA							
2002m1-2016m1		*2002m1-2006m12*		*2007m1-2008m12*		*2009m1-2016m1*	
Country		*Country*		*Country*		*Country*	
China	0.493	China	0.515	China	0.486	Anguilla	0.476
Anguilla	0.437	Burundi	0.469	Anguilla	0.442	China	0.463
Burundi	0.407	Namibia	0.426	Costa Rica	0.432	Chile	0.436
Costa Rica	0.390	Pakistan	0.414	Chile	0.430	Venezuela	0.415
Colombia	0.386	Costa Rica	0.395	Namibia	0.413	Morocco	0.411
Morocco	0.384	Anguilla	0.382	Colombia	0.410	Colombia	0.399
Pakistan	0.375	Belize	0.370	Pakistan	0.390	Costa Rica	0.375
Venezuela	0.366	Bolivia	0.368	Solomon Is.	0.383	Burundi	0.371
South Africa	0.359	Colombia	0.359	Afghanistan	0.383	India	0.358
Chile	0.353	South Africa	0.356	Fiji	0.381	South Africa	0.354
Fiji	0.352	Morocco	0.351	South Africa	0.381	Fiji	0.349
Namibia	0.352	Central Af. R.	0.348	Morocco	0.374	Kosovo	0.347
Belize	0.350	Fiji	0.346	Burundi	0.364	Pakistan	0.343
India	0.346	Afghanistan	0.333	Maldives	0.364	Paraguay	0.339
Kosovo	0.340	India	0.333	Belize	0.361	Belize	0.333
Ukraine	0.323	Kosovo	0.329	India	0.354	Poland	0.325
Russian Fed.	0.307	Dominican Rep.	0.322	Congo, DR	0.349	Ukraine	0.322
Central Af. R.	0.306	Ukraine	0.318	Kosovo	0.348	Suriname	0.319
Suriname	0.305	Venezuela	0.311	Poland	0.343	Chad	0.316
Bolivia	0.305	Bangladesh	0.309	Ukraine	0.340	Congo, DR	0.315
Bottom 20 Countries: Mean A-BLC-to-TA							
2002m1-2016m1		*2002m1-2006m12*		*2007m1-2008m12*		*2009m1-2016m1*	
Country		*Country*		*Country*			*ALCM-to-TA*
Uruguay	0.144	Mexico	0.137	Syrian Arab Republic	0.138	Tajikistan	0.142
Mauritius	0.135	Botswana	0.131	Kyrgyz Republic	0.124	Jamaica	0.131
Serbia, Republic of	0.132	Philippines	0.128	Gambia, The	0.122	Philippines	0.125
St. Kitts and Nevis	0.131	Equatorial Guinea	0.118	Eritrea	0.118	Egypt	0.124
Trinidad and Tobago	0.127	Egypt	0.114	Mauritius	0.116	Botswana	0.122
Gambia, The	0.127	Turkey	0.110	Trinidad and Tobago	0.113	Brazil	0.122
Philippines	0.124	Macedonia, FYR	0.108	Uruguay	0.113	Tonga	0.121
Myanmar	0.121	Sierra Leone	0.100	Jamaica	0.107	Trinidad and Tobago	0.119
Eritrea	0.120	Haiti	0.100	Equatorial Guinea	0.107	Gambia, The	0.119
Egypt	0.118	Romania	0.081	Philippines	0.105	Mauritius	0.116
Botswana	0.106	Bhutan	0.075	Egypt	0.100	China, P.R.: Macao	0.107
Haiti	0.097	Comoros	0.072	Brazil	0.094	St. Kitts and Nevis	0.103
Jamaica	0.094	Albania	0.068	Myanmar	0.080	Haiti	0.101
Brazil	0.093	Algeria	0.055	Haiti	0.074	Cambodia	0.099
China, P.R.: Macao	0.077	Brazil	0.054	Algeria	0.069	Eritrea	0.095
Algeria	0.077	Nicaragua	0.054	Serbia, Republic of	0.055	Algeria	0.094
Cambodia	0.066	China, P.R.: Macao	0.044	China, P.R.: Macao	0.055	Myanmar	0.084
Iraq	0.036	Jamaica	0.039	Montserrat	0.032	Montserrat	0.028
Montserrat	0.020	Montserrat	0.005	Botswana	-0.012	Iraq	0.023
South Sudan	-0.033	Cambodia	-0.008	Iraq	-0.035	South Sudan	-0.033

Sources: Authors' computations based on data from IFS.

In our last set of descriptive statistics, we further analyse the time series characteristics of our measure of aggregate liquidity creation in relation to its cross-sectional dimension and a variety of country groupings. We document that liquidity creation in DECs was particularly pronounced in the post-crisis period, with some countries depicting notable growth in this metric.

The bottom panel of Table 2 reports the ranking of the countries with the lowest degree of bank liquidity creation by sub-periods. The pre-, during- and post-crisis rankings show that the countries that systematically appear in all sub-periods are less numerous than what is observed in the top panel, with

only Botswana, the Philippines, Egypt, Haiti, Algeria, Brazil, Jamaica and Montserrat appearing consistently in all sub-periods. The emerging European countries that appeared in the bottom-20 ranking before the crisis, that is Macedonia, Romania and Turkey, experience an escalation in bank liquidity creation post-crisis, disappearing from the ranking during this period. Countries with the lowest degree of bank liquidity creation in the post-crisis period are mainly from developing Africa and the Middle-East.

Tables A.7.a and A.7.b (Appendix) complement the evidence provided in Table 2 by showing pre- and post-crisis descriptive statistics of bank liquidity creation by country groups. Overall, average post-crisis A-BLC-to-TA is equal to 0.232, which is 5% higher than what was observed pre-crisis. European, Latin America and Caribbean countries have depicted the most notable post-crisis increase in average A-BLC-to-TA. In Africa and the Middle-East this increase was somewhat less important, while in Asia and Pacific countries average bank liquidity creation post-crisis was lower than what was observed pre-crisis. Country groups by income reveal that post-crisis bank liquidity creation was relatively high for high- and medium-income country groups. Low-income countries, on the other hand, experienced a more contained increase in post-crisis bank liquidity creation alongside a very high cross-country volatility. Country groupings by financial market development show that countries with a low level of financial development, as measured by the four proxies, have increased bank liquidity creation post-crisis. On the other hand, countries with high financial depth have experienced lower post-crisis bank liquidity creation, down by 4% on average, while countries with medium and low financial markets depth have shown the largest increase in post-crisis A-BLC-to-TA, up by 11% and 10% respectively.

Figure A.2 in the Appendix shows the time series behaviour of A-BLC-to-TA averaged over different country groupings, with three main stylized facts. Firstly, with respect to geography, pre-2005 the low level of A-BLC-to-TA was striking for emerging Europe. However, its unique underlying upward deterministic trend implies that, by the start of the GFC, emerging Europe had become the top creator of bank liquidity, a role that it kept until 2011 (the start of the Greek crisis). The Asian series had a scissors' like movement in common with the Latin American one, which from lowest bank liquidity creator pre-crisis became highest creator (with the exception of Europe until 2011, and overall thereafter) post-crisis. Conversely, Asia was the top bank liquidity creator pre-crisis while it became the bottom one subsequently (and especially so from 2012 onwards). Secondly, in terms of income levels, the 2005-09 period stands out in as much as A-BLC was similar across such groups. The pre-2002 period was rather unique since the ranking for A-BLC was middle-high, middle-low, low and high. In contrast there are similarities between the 2002-05 and post-2008 periods in as much as the ranking for these two subsamples was rather middle-low, middle-high and high, low. Thirdly, although, as showed in Table A.7.b, countries with low financial market development have experienced high levels of average bank liquidity creation post-crisis, there is a positive relationship between financial market development and bank liquidity creation which persists over time. In particular, the observed

post-crisis increase in A-BLC for countries with low financial market development translates into a convergence in bank liquidity creation to that observed for countries with medium financial development. For financial market access, there is overall a positive relationship: the higher the access, the higher A-BLC. However, the difference between medium and low access vanished from 2014 onwards. For financial market depth, a positive relationship is also apparent: the deeper the market, the higher A-BLC. But there were upward step-wise movements for medium and low, especially after 2007 and 2012, when these two converged. Accordingly, A-BLC is now identical across countries, independently of depth. The relationship with efficiency was positive, until 2005, and medium and low were identical up to 2010, but a final convergence is noticeable, with medium taking slightly over.

4. Panel data analysis: Drivers of A-BLC

4.1 Baseline model

In this section we formally examine the drivers of A-BLC through dynamic panel regression analysis. The estimated baseline model has the following form:

$$ABLC_{i,t} = \alpha_i + \delta_t + \rho_{i,t}\, ABLC_{i,t-1} + \beta\, \Delta_{i,t} + \Omega\, X_{i,t} + \varepsilon_{i,t} \qquad (3)$$

where $ABLC_{i,t}$ is the A-BLC-to-TA is our metric of liquidity creation, normalised by total assets. α_i is the country fixed effects that captures time-invariant country features and δ_t is a time dummy which accounts for those common/global factors which affect all countries. $\boldsymbol{\Delta}_{i,t}$ is a vector of macro variables for each country i and $X_{i,t}$ contains country-level banking development indicators. The latter set of indicators have often been used in the literature in order to capture the differences in financial markets structures which affect cross-country differences in loan provision (see Buch et al., 2010 , and Beck et al. , 2000). The macro controls are: exchange rate against the US dollar (in logarithm), *er*, real interest rate (transformed as *log[1+(real interest rate/100)]*), *ir*, and real GDP per capita (in log), *y*, as well as an indicator of FDI intensity, *fdi*[12]. The vector of banking development indicators contains the following proxies: the log of commercial bank branches per 100,000 adults, *acc*, for access; domestic credit to private sector in dollars (in log), *depth*, for depth; interest rate spread, *eff*, for efficiency; and banking reserves to total assets, *stab*, for stability[13]. The data used is annual over the years 2001-2015 due to the restricted availability of the explanatory variables at a low frequency[14].

Regression (3) is estimated by means of a dynamic generalised method of moments (GMM) technique which corrects for endogeneity in the variable. Endogeneity can here arise from feedbacks from liquidity creation to macro controls and banking development indicators. This may be particularly true for the depth and stability proxies as more bank liquidity creation may lead to higher domestic credit to private sector by banks as well as lower banking reserves. GMM estimators are best suited for

[12] Unless otherwise specified the variables are obtained from the World Bank database.
[13] The choice of these proxies depends on the availability of data over a larger set of countries in the sample.
[14] All series entering the regressions are I(0). Panel unit root tests (Levine, Lin and Chu, 2002) have been carried out on the series prior to estimation.

panels with a large number of cross-sections and small time dimension such as the one used in this empirical estimation.

The investigation of the relationship between liquidity creation and banking development is supported by the literature presented in section 2 and we believe is meaningful for the DECs sample of countries. In line with the existing findings, we expect a positive relationship between liquidity creation and banking development as well as a heightened vulnerability to local financial stability during global downturns in those countries in which banks engage more in liquidity creation.

Model (3) is estimated by a two-step difference estimator, as proposed by Arellano and Bond (1991)[15]. The fixed effect is removed by first differencing (3) under the assumptions of lack of correlation between the differenced error term and the lagged dependent variable and the weak exogeneity of the explanatory variables.

Table 3 reports the two-step GMM difference estimates of (3) in which banking development indicators enter the regression in turn. Our predictions put forward in the previous section are overall confirmed and the signs of the explanatory variables are as expected. The coefficient of *y* is positive and significant across specifications (a)-(f), confirming that in DECs with higher income per capita banks create more liquidity. The other macro controls also exhibit expected behaviours. In particular, the estimated coefficient of *ir* is negative and significant across specifications, in line with the fact that as borrowing becomes more expensive liquidity creation by banks falls (loans have a positive weight in the A-BLC measure). Turning to banking development proxies (specifications *c-f*) we find that access is the only proxy which is not significant (specification *c*). As expected, the estimated coefficient of *depth* is positive and significant (specification *e*) and the stability proxy is negatively associated with liquidity creation (specification *d),* while the coefficient associated with efficiency is negative and significant (specification *f*). The latter evidence suggests that those banking systems which feature higher interest rate spreads tend to create less liquidity. This may be indirectly linked to the fact that higher liquidity creation is often a result of banks attempting to boost their profit, when a fall in efficiency occurs.

Altogether this evidence suggests that in DECs bank liquidity creation is stimulated wherever banks have a large existing stock of outstanding loans and do not tend to keep excessive levels of reserves on their balance sheet.

[15] The two-step estimator has been showed to be more asymptotically efficient than the one-step estimator, see Arellano and Bond (1991) for a discussion.

Table 3. Two-step difference dynamic GMM estimation: baseline model.
Dependent variable: A-BLC-to-TA ($ABLC_{i,t}$)

Specification	(a) Baseline		(b) Baseline+er		(c) Baseline+Access		(d) Baseline+Stability		(e) Baseline+Depth		(f) Baseline+Efficiency	
	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat
ABLC(-1)	0.599***	0.011	0.595***	45.647	0.678***	37.632	0.443***	38.293	0.557***	50.390	0.586***	30.139
y	0.079***	0.014	0.092***	6.642	0.038**	1.975	0.087***	6.824	0.035***	2.641	0.044***	2.687
ir	-0.090***	0.010	-0.071***	-6.773	-0.127***	-8.261	-0.089***	-11.934	-0.018*	-1.814	-0.042***	-4.245
fdi	0.001***	0.000	0.001***	10.045	0.001***	3.078	0.000	1.809	0.001***	4.004	0.000	0.157
er			0.033***	3.878								
acc					-0.007	-1.138						
stab							-0.001***	-17.738				
depth									0.045***	21.482		
eff											-0.005***	-8.729
Country fixed effect	Yes		Yes		Yes		Yes		Yes		Yes	
Period fixed effect	Yes		Yes		Yes		Yes		Yes		Yes	
No. observations	1139		1126		924		1120		1107		1109	
No. of cross sections	101		100		100		99		98		98	
Sargant Test (p-value)	0.434		0.388		0.397		0.317		0.246		0.484	
AR(2) (p-value)	0.793		0.82		0.933		0.701		0.621		0.865	

Notes: Table 3 reports the estimates of model (3). The t-statistics are based on White heteroskedasticity-consistent standard errors. Under the null hypothesis of the Sargan test over-identifying restrictions are valid. The null hypothesis of the AR(2) test implies no second order autocorrelation. Time sample 2003-2015. Time effect coefficients not reported to save space. ***, **, * represent 1, 5 and 10% significance.

4.2 Robustness checks

Table 4 extends model (3) by including a bank-liquidity-creation common factor, *cs*, in specifications *(a)*, and two measures of the monetary policy stance in the US: the change in shadow funds rate, *sfr*, in specification (b) and a measure of monetary policy shocks, *brw*, in column (c). As proposed by Pesaran (2007), we include as explanatory variable *cs*, the cross-sectional average of A-BLC, to capture common developments in bank liquidity creation across the whole sample of developing and emerging countries. This variable allows us to account for in-sample cross-sectional dependence in bank liquidity creation. Alternative measures of monetary policy in the US capture the stance of monetary policy in developed countries. To this extent, we use the shadow fed funds rate (*sfr*) developed by Wu and Xia (2016) which provides a better indication of monetary policy than the observed fed funds rate in a zero-lower-bound setting (Bullard, 2012). We also consider the US monetary shock series, *brw*, proposed by Bu et al. (2021) to account for periods of conventional and unconventional monetary policy stances. Coefficients of the different drivers do not change sign, and are generally of a similar magnitude with either proxy of US monetary impulses, and only on-third smaller for y with sfr than with brw. Additionally, in specification (d) we report the baseline specification augmented by regional dummies with the intent to capture the geographical variations in the evolution of liquidity creation over time, as partly explored in Section 3.

Table 4. Two-step difference dynamic GMM estimation: extended model I
Dependent variable: A-BLC-to-TA ($ABLC_{i,t}$)

Specification	(a)		(b)		(c)		(d)	
	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat
ABLC(-1)	0.592***	41,991	0.636***	50,040	0.573***	26,103	0.514***	21,826
y	0.098***	5,537	0.084***	6,344	0.128***	5,523	0.144***	3,969
ir	-0.075***	-5,907	-0.078***	-7,362	-0.085***	-6,112	-0.069***	-3,873
er	0.033***	9,735	0.029***	9,059	0.044***	6,361	0.042***	6,196
fdi	0.001***	3,729	0.001***	3,160	0.001***	2,394	-0.001**	-2,074
cs	-0.406	-0,695						
sfr			-0.014***	-6,364				
brw					0.427***	3,388		
t							0.003	1,239
Europe*t							-0.003	-0,979
Asia*t							-0.020***	-7,404
LAmerica*t							-0.008**	-2,015
Offshore*t							0.035***	2,567
Country fixed effect	Yes		Yes		Yes		Yes	
Period fixed effect	Yes		Yes		Yes		Yes	
No. observations	1139		1126		1126		1069	
No. of cross sections	100		100		100		100	
Sargant Test (p-value)	0,371		0,341		0,399		0,215	
AR(2) (p-value)	0,689		0,398		0,748		0,225	

Notes: Table 4 specification (a) reports the regression estimates of the following model:

$$ABLC_{i,t} = \alpha_i + \delta_t + \rho_{i,t} ABLC_{i,t-1} + \beta \boldsymbol{\Delta}_{i,t} + \Omega X_{i,t} + t_t + cs_{i,t} + \varepsilon_{i,t}$$

Where $cs_{i,t}$ refers to the cross-sectional weighted average of A-BLC-to-TA in the spirit of Pesaran (2007).
Specification (b) estimates the following model:

$$ABLC_{i,t} = \alpha_i + \delta_t + \rho_{i,t} ABLC_{i,t-1} + \beta \boldsymbol{\Delta}_{i,t} + \Omega X_{i,t} + t_t + region_i * t_t + \varepsilon_{i,t}$$

Where t_t is the time trend and $region_i$ refers to the regional dummy.
Specification (c) estimates the following model:

$$ABLC_{i,t} = \alpha_i + \delta_t + \rho_{i,t} ABLC_{i,t-1} + \beta \boldsymbol{\Delta}_{i,t} + \Omega X_{i,t} + t_t + sfr_{i,t} + \varepsilon_{i,}$$

Where *sfr* is the shadow funds rate (Wu and Xia, 2016) and *brw* is a measure for monetary policy shocks (Bu et al. 2021).. In all specifications $\boldsymbol{\Delta}_i$ refers to the vectors of the macroeconomic variables. The t-statistics are based on White heteroskedasticity-consistent standard errors. Under the null hypothesis of the Sargan test over-identifying restrictions are valid. The null hypothesis of the AR(2) test implies no second order autocorrelation. All regressions were estimated over the 2003-15 time frame. Time effect coefficients are not reported to save space. ***, **, * represent 1, 5 and 10% significance levels.

While there is no significant evidence in support of cross-sectional dependence of A-BLC, as the estimated coefficient for *cf* is not significant, there is evidence suggesting that the monetary policy stance in the US can impact liquidity creation in DECs. That is, a looser US monetary policy, associated with a fall in *sfr* or an increased in *brw*, stimulates bank liquidity creation in DECs within the same quarter. Such significant liquidity spillovers from the US to DECs in conjunction with expansionary monetary policy in the former country were already identified in the literature (see for instance Fratzscher et al., 2018). The geographical dummies reveal that offshore locations (*Offshore*) experienced a positive and significant increase of liquidity creation over the sample considered relative to the left-out group (Developing Africa and Middle East). On the contrary, developing Asian (*Asia*) and Latin American countries (*LAmerica*) experienced a significant decline in liquidity creation in relative terms.

In order to rule out the possibility that our results are driven by the quality of reporting of countries non-compliant with international reporting standards, we re-run specifications (b) and (c) in Table 4 for the subsample of 94 IFRS-complying countries of our sample, as reported in Table A.8 in the Appendix. Overall, the estimates show that our results are robust to the exclusion of non-compliant

countries in the whole sample, in particular with respect to the coefficient of the alternative proxies of the change in the US monetary policy stance . The major exception to this pattern concerns the exchange rate, which is no longer significant in the sample including only complying countries. This could be explained by the high volatility of exchange rates in some non-complying countries, such as in Algeria and Mozambique. Moreover, the exchange rate remains significant for complying countries when the brw proxy of US monetary impulses is used.

Table 5. Two-step difference dynamic GMM estimation: extended model II. Dependent variable: A-BLC-to-TA ($ABLC_{i,t}$)

Specification:	(a)		(b)		(c)		(d)	
	Baseline+ER+Access		Baseline+ER+Depth		Baseline+ER+Efficiency		Baseline+ER+Stability	
	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat
ABLC(-1)	0.643***	23.359	0.391***	19.441	0.579***	20.415	0.421***	16.358
y	0.021	0.612	0.006	0.191	-0.000	-0.012	0.085***	2.881
ir	-0.039	-1.084	0.036	1.493	0.124***	5.608	0.016	0.818
er	0.003	2.587	-0.043	-6.859	-0.005	-0.794	-0.011	-1.446
fdi	-0.004	-0.516	0.004***	2.828	0.003**	2.152	0.000	0.364
acc	-0.003	-0.374						
depth			0.003***	7.204				
eff					-0.005***	-4.604		
stab							-0.001***	-7.031
y*pc	0.013**	2.501	0.035***	6.413	0.020***	3.880	0.011**	2.371
ir*pc	-0.057	-1.410	-0.169***	-5.908	-0.285***	-10.464	-0.185**	-6.383
er*pc	0.0111***	5.673	0.008**	2.495	0.004*	1.941	0.003	1.573
fdi*pc	-0.003**	-2.180	-0.004**	-2.297	-0.003***	-2.808	-0.001	-0.430
acc*pc	0.015***	2.926						
depth*pc			0.001*	1.870				
eff*pc					0.005***	3.680		
stab*pc							0.000**	2.029
pc	-0.129***	-2.773	-0.343***	-6.983	-0.153***	-2.579	-0.101**	-2.050
Country fixed effect	Yes		Yes		Yes		Yes	
Period fixed effect	Yes		Yes		Yes		Yes	
No. observations	913		1126		1096		1107	
No. of cross sections	99		100		97		98	
Sargant Test (p-value)	0.375		0.385		0.417		0.269	
AR(2) (p-value)	0.586		0.336		0.189		0.537	

Notes: Table 5 reports the regression estimates of the following model:

$$ABLC_{i,t} = \alpha_i + \delta_t + \rho_{i,t}\, ABLC_{i,t-1} + \beta\, \Delta_{i,t} + \Omega X_{i,t} + pc + X_{i,t} * pc\, \delta + \varepsilon_{i,t}$$

Where *pc* is a dummy equal to one over the period 2009-2015. $\Delta_{i,t}$ and $X_{i,t}$ refer to the vectors of the macroeconomic and banking development variables respectively. The t-statistics are based on White heteroskedasticity-consistent standard errors. Under the null hypothesis of the Sargan test over-identifying restrictions are valid. The null hypothesis of the AR(2) test implies no second order autocorrelation. All regressions were estimated over the 2003-15 time frame. Time effect coefficients are not reported to save space. ***, **, * represent 1, 5 and 10% significance level respectively.

Table 5 extends the baseline model further by including interaction variables with a post-crisis dummy, *pc*, equal to one in 2009-2015. Overall, as shown in the last row of Table 5, we find that liquidity creation decreased significantly post-crisis with a negative and significant coefficient of *pc* across specifications *(a)* to *(d)*. Interestingly, some control variables, such as *acc*, turn significant post-crisis, suggesting that higher levels of banking sector access lead to higher bank liquidity creation in the second part of the sample. The estimated coefficient of efficiency turns positive post-crisis,

revealing that more efficient (thus, more profitable) banking sectors in DECs create more liquidity, a possibly more intuitive result than what we found earlier. The zero coefficient of *stab*pc* in specification (*d*) suggests that the (negative) relationship between reserve accumulation and liquidity creation disappears post-crisis.

5. Conclusions

Global liquidity shortages in financial markets as well as in bank-intermediated financial flows represented a major concern in the aftermaths of the Global Financial Crisis and pre-crisis excess in bank liquidity creation is often held responsible for this phenomenon. The measurement of liquidity creation on a global basis remains a challenge for researchers. Indeed, while data for the components of liquidity is available for advanced countries, particularly with the collection of ample bank-by-bank data, this is not generally the case for developing and emerging countries. Indeed, for many of the latter, there are hardly any, or only shallow, financial markets, and even for financial intermediaries, exhaustive disaggregated data on bank liquidity is simply unavailable. The present paper sidestepped such limitations by proposing the first high-frequency and global data base of macroeconomic or aggregate (i.e. country-wide) bank liquidity creation for 114 developing and emerging countries at a monthly frequency over a 15-year sample.

Such a database enabled us to establish the first stylized facts with respect to the behaviour of aggregate bank liquidity creation (A-BLC), both on a cross-country basis and over time. Such a measure proved able to track, for the average of developing and emerging countries, the gradual build-up of bank liquidity creation up to 2006 and its sharp acceleration on the eve of the GFC, as well as its subsequent scaling down, and its subsequent alarming rise to levels as high as those reached during the 2008 peak. This is particularly noteworthy since alternative measures, such as bank credit to the private sector or the, very volatile, liquidity transformation gap, were far less able to track such movements. The stylised facts we established imply contrasted relationships of A-BLC with major characteristics of banking sector development. Indeed, while access, stability and financial market depth are positively linked with bank liquidity creation, the latter has a hump-shaped relationship with financial market efficiency (or income levels).

More formal quantitative analysis exploiting the panel dimension of this global database reveals that bank liquidity creation increases in those DECs with higher banking sector depth and lower excess reserves on banks' balance sheets. While there is an overall inflection in post-crisis liquidity creation in DECs, significant regional divergences occur with offshore centres experiencing an actual increase in our metric. Lastly, we find evidence in support of the fact that expansionary monetary policy in developed countries, in the US in particular, has stimulated bank liquidity creation in DECs, indirectly suggesting global liquidity spillovers from developed economies to DECs.

Our dataset provides researchers and regulators with a comprehensive tool for monitoring and analysing the banking sector's vulnerabilities at an aggregate and comparable level across DECs. The impossibility to measure macro liquidity creation, i.e. for the whole banking system of a given developing or emerging country, in a comparable way, across-countries (via a bottom-up approach), has constituted so far an important drawback for macro-prudential regulators who wish to monitor systemic risk at both the national, regional and global levels.

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Appendix

Table A.1 The 114 countries included in the dataset

Countries					
Afghanistan	Burundi	Equatorial Guinea	Korea, Republic	Nigeria	St. Kitts and Nevis
Albania	Cabo Verde	Eritrea	Kosovo	Oman	St. Lucia
Algeria	Cambodia	Fiji	Kuwait	Pakistan	St. Vincent and the Grenadines
Angola	Cameroon	Gabon	Kyrgyz Republic	Panama	Sudan
Anguilla	Central African Republic	Gambia, The	Lesotho	Papua New Guinea	Suriname
Antigua and Barbuda	Chad	Georgia	Macedonia, FYR	Paraguay	Swaziland
Armenia	Chile	Ghana	Malaysia	Philippines	Syrian Arab Republic
Azerbaijan	*China*	Grenada	Maldives	Poland	Tajikistan
Bangladesh	China, P.R.: Macao	Guatemala	Mauritius	Qatar	Tanzania
Barbados	Colombia	Guyana	Mexico	Romania	Thailand
Belarus	Comoros	Haiti	Moldova	Russian Federation	Tonga
Belize	Congo, Democratic Republic	Hounduras	Mongolia	Samoa	Trinidad and Tobago
Bhutan	Congo, Republic of	Hungary	Montserrat	Sao Tome and Principe	Turkey
Bolivia	Costa Rica	*India*	Morocco	Serbia, Republic	Uganda
Bosnia and Herzegovina	Croatia	Indonesia	Mozambique	Seychelles	Ukraine
Botswana	Czech Republic	Iraq	Myanmar	Sierra Leone	Uruguay
Brazil	Dominica	Jamaica	Namibia	Solomon Islands	Vanuatu
Brunei Darussalam	Dominican Republic	Kazakhstan	Nepal	South Africa	Venezuela, Republica
Bulgaria	Egypt	Kenya	Nicaragua	South Sudan	Zambia

Notes: The Table above reports all the countries for which A-BLC is computed. For China and India there are some minor differences in A -BLC construction due to data availability.

Table A.2: Descriptive Statistics A-BLC-to-TA (2001-2016)

Country	Mean	Median	Max	Min.	Quant.*	Std. Dev.	Range	Obs.
Afghanistan	0.280	0.248	0.416	0.162	0.337	0.077	0.254	109
Albania	0.156	0.186	0.239	0.021	0.199	0.065	0.218	158
Algeria	0.077	0.076	0.167	0.008	0.088	0.036	0.159	169
Angola	0.214	0.226	0.312	0.072	0.240	0.052	0.240	169
Anguilla	0.437	0.449	0.548	0.295	0.463	0.052	0.253	168
Antigua and Barbuda	0.239	0.237	0.314	0.167	0.252	0.035	0.146	168
Armenia	0.201	0.200	0.261	0.134	0.227	0.034	0.127	169
Azerbaijan	0.221	0.225	0.272	0.137	0.239	0.031	0.135	169
Bangladesh	0.289	0.294	0.322	0.246	0.305	0.022	0.076	170
Barbados	0.285	0.288	0.321	0.239	0.299	0.019	0.082	106
Belarus	0.201	0.207	0.319	0.048	0.267	0.082	0.271	170
Belize	0.350	0.343	0.422	0.312	0.362	0.023	0.110	169
Bhutan	0.185	0.189	0.385	-0.010	0.260	0.103	0.395	168
Bolivia	0.305	0.296	0.397	0.195	0.349	0.056	0.203	169
Bosnia and Herzegovina	0.255	0.260	0.313	0.154	0.266	0.025	0.159	169
Botswana	0.106	0.137	0.240	-0.058	0.172	0.086	0.298	169
Brazil	0.093	0.100	0.149	0.010	0.119	0.042	0.139	169
Brunei Darussalam	0.223	0.234	0.308	0.124	0.259	0.051	0.184	169
Bulgaria	0.278	0.284	0.331	0.179	0.293	0.034	0.152	169
Burundi	0.407	0.386	0.576	0.321	0.413	0.067	0.255	167
Cabo Verde	0.257	0.241	0.353	0.206	0.273	0.040	0.148	168
Cambodia	0.066	0.104	0.187	-0.152	0.131	0.101	0.339	169
Cameroon	0.205	0.199	0.295	0.123	0.227	0.041	0.172	168
Central African Republic	0.306	0.307	0.382	0.194	0.335	0.042	0.188	167
Chad	0.281	0.267	0.435	0.164	0.297	0.058	0.271	168
Chile	0.353	0.422	0.469	0.163	0.437	0.117	0.306	168
China	0.493	0.499	0.553	0.429	0.510	0.031	0.124	127
China, P.R.: Macao	0.077	0.079	0.133	0.029	0.104	0.033	0.104	169
Colombia	0.386	0.390	0.444	0.332	0.401	0.026	0.112	167
Comoros	0.151	0.161	0.293	0.016	0.188	0.072	0.277	167
Congo, Democratic Republic (	0.290	0.296	0.408	0.100	0.318	0.066	0.308	168
Congo, Republic of	0.239	0.235	0.356	0.064	0.291	0.070	0.292	168
Costa Rica	0.390	0.392	0.469	0.315	0.410	0.037	0.154	170
Croatia	0.203	0.200	0.239	0.148	0.211	0.016	0.090	169
Czech Republic	0.244	0.283	0.329	0.100	0.299	0.073	0.229	168
Dominica	0.192	0.194	0.233	0.158	0.201	0.014	0.075	168
Dominican Republic	0.270	0.251	0.410	0.204	0.276	0.050	0.206	170
Egypt	0.118	0.113	0.160	0.091	0.124	0.018	0.069	144
Equatorial Guinea	0.176	0.186	0.339	-0.052	0.241	0.093	0.390	167
Eritrea	0.120	0.119	0.170	0.038	0.140	0.028	0.132	151
Fiji	0.352	0.358	0.410	0.248	0.385	0.041	0.163	170
Gabon	0.208	0.204	0.288	0.105	0.236	0.043	0.183	167
Gambia, The	0.127	0.124	0.190	0.076	0.134	0.022	0.114	161
Georgia	0.245	0.252	0.321	0.152	0.264	0.038	0.169	170
Ghana	0.246	0.250	0.304	0.174	0.267	0.032	0.130	166
Grenada	0.270	0.276	0.296	0.215	0.284	0.021	0.082	168
Guatemala	0.246	0.253	0.304	0.195	0.257	0.024	0.110	170
Guyana	0.158	0.153	0.210	0.121	0.165	0.021	0.089	168
Haiti	0.097	0.092	0.165	0.044	0.111	0.031	0.122	169
Hounduras	0.198	0.190	0.249	0.153	0.217	0.026	0.096	169
Hungary	0.197	0.195	0.277	0.134	0.223	0.032	0.143	156
India	0.346	0.351	0.376	0.307	0.360	0.019	0.069	136
Indonesia	0.185	0.193	0.254	0.099	0.215	0.042	0.154	169
Iraq	0.036	0.023	0.369	-0.110	0.052	0.085	0.479	121
Jamaica	0.094	0.104	0.172	0.005	0.119	0.048	0.166	169
Kazakhstan	0.193	0.190	0.254	0.141	0.210	0.027	0.113	146
Kenya	0.270	0.276	0.331	0.224	0.293	0.029	0.107	169
Korea, Republic of	0.299	0.295	0.329	0.282	0.303	0.010	0.047	169

Table A.2 (continued): Descriptive Statistics A-BLC-to-TA

Country	Mean	Median	Max	Min.	Quant.*	Std. Dev.	Range	Obs.
Kosovo	0.340	0.342	0.408	0.175	0.353	0.031	0.233	170
Kuwait	0.236	0.244	0.282	0.122	0.254	0.035	0.159	167
Kyrgyz Republic	0.196	0.201	0.329	0.041	0.242	0.065	0.288	166
Lesotho	0.253	0.247	0.344	0.172	0.295	0.049	0.171	170
Macedonia, FYR	0.166	0.180	0.254	0.086	0.191	0.044	0.168	157
Malaysia	0.248	0.244	0.289	0.208	0.257	0.020	0.081	169
Maldives	0.278	0.285	0.392	0.166	0.323	0.066	0.226	169
Mauritius	0.135	0.120	0.265	0.098	0.129	0.043	0.167	170
Mexico	0.165	0.169	0.228	0.118	0.180	0.026	0.110	169
Moldova	0.174	0.183	0.223	0.091	0.192	0.031	0.132	170
Mongolia	0.264	0.264	0.356	0.126	0.289	0.047	0.229	170
Montserrat	0.020	0.019	0.067	-0.055	0.037	0.024	0.122	168
Morocco	0.384	0.380	0.435	0.325	0.406	0.031	0.111	170
Mozambique	0.295	0.299	0.364	0.165	0.312	0.037	0.199	169
Myanmar	0.121	0.103	0.325	0.015	0.141	0.076	0.310	152
Namibia	0.352	0.381	0.463	0.249	0.413	0.075	0.215	167
Nepal	0.252	0.254	0.298	0.146	0.270	0.026	0.153	168
Nicaragua	0.145	0.163	0.256	-0.032	0.214	0.084	0.288	169
Nigeria	0.216	0.202	0.355	0.147	0.220	0.053	0.208	169
Oman	0.222	0.221	0.258	0.191	0.229	0.014	0.067	108
Pakistan	0.375	0.369	0.477	0.316	0.399	0.039	0.161	170
Panama	0.189	0.181	0.231	0.155	0.204	0.023	0.076	157
Papua New Guinea	0.174	0.174	0.279	0.089	0.211	0.051	0.190	169
Paraguay	0.279	0.284	0.379	0.168	0.339	0.067	0.212	170
Philippines	0.124	0.127	0.146	0.086	0.130	0.013	0.060	168
Poland	0.291	0.314	0.365	0.122	0.327	0.063	0.243	169
Qatar	0.181	0.177	0.258	0.114	0.198	0.036	0.144	170
Romania	0.184	0.236	0.281	0.037	0.245	0.082	0.244	169
Russian Federation	0.307	0.313	0.328	0.267	0.318	0.016	0.061	66
Samoa	0.274	0.272	0.408	0.189	0.284	0.042	0.219	169
Sao Tome and Principe	0.169	0.165	0.265	0.085	0.179	0.035	0.180	159
Serbia, Republic of	0.132	0.148	0.204	0.026	0.164	0.045	0.178	146
Seychelles	0.233	0.229	0.364	0.171	0.244	0.036	0.192	169
Sierra Leone	0.165	0.183	0.255	0.041	0.203	0.058	0.214	169
Solomon Islands	0.198	0.165	0.446	0.073	0.212	0.103	0.372	168
South Africa	0.359	0.355	0.409	0.317	0.371	0.021	0.092	169
South Sudan	-0.033	-0.044	0.095	-0.129	0.005	0.062	0.224	55
St. Kitts and Nevis	0.131	0.120	0.213	0.085	0.158	0.031	0.127	168
St. Lucia	0.299	0.303	0.350	0.151	0.310	0.029	0.199	168
St. Vincent and the Grenadine	0.228	0.227	0.253	0.205	0.235	0.011	0.048	168
Sudan	0.201	0.203	0.261	0.126	0.221	0.030	0.135	168
Suriname	0.305	0.317	0.358	0.091	0.328	0.046	0.267	169
Swaziland	0.286	0.290	0.349	0.217	0.304	0.029	0.131	169
Syrian Arab Republic	0.179	0.182	0.233	0.101	0.198	0.031	0.133	121
Tajikistan	0.157	0.140	0.337	0.056	0.166	0.074	0.281	170
Tanzania	0.245	0.253	0.282	0.171	0.262	0.026	0.111	166
Thailand	0.206	0.204	0.258	0.165	0.227	0.026	0.093	169
Tonga	0.182	0.212	0.318	0.053	0.239	0.077	0.265	169
Trinidad and Tobago	0.127	0.118	0.182	0.097	0.136	0.023	0.084	169
Turkey	0.186	0.186	0.281	0.060	0.237	0.064	0.222	157
Uganda	0.274	0.274	0.330	0.230	0.286	0.021	0.100	167
Ukraine	0.323	0.325	0.370	0.271	0.336	0.023	0.099	170
Uruguay	0.144	0.147	0.272	0.088	0.157	0.042	0.184	169
Vanuatu	0.233	0.213	0.350	0.130	0.286	0.065	0.219	168
Venezuela, Republica	0.366	0.366	0.482	0.178	0.407	0.068	0.304	169
Zambia	0.246	0.245	0.312	0.172	0.269	0.035	0.141	169
All	0.227	0.228	0.576	-0.152	0.278	0.101	0.728	18479

*Quantiles computed for p=0.7, using the Rankit (Cleveland) definition.

Notes: Table 2 contains descriptive statistics of the A-BLC measure divided by total assets by country over the period 2001-2016. The range refers to the difference between the maximum and minimum value observed for one country over the sample of reference.

Table A.3. *A-BLC*-to-TA by country groups

	Mean	Median	Max	Min.	Quant.*	St. Dev.	Range	Obs.
Geographical Area								
Asia and Pacific	0.226	0.230	0.553	-0.152	0.275	0.103	0.705	4556
Latin America and Car.	0.236	0.224	0.482	-0.032	0.297	0.105	0.514	4040
Africa and middle east	0.226	0.230	0.576	-0.129	0.272	0.097	0.706	6065
Offshore	0.216	0.222	0.548	-0.055	0.280	0.126	0.603	1285
Europe	0.226	0.224	0.408	0.021	0.277	0.080	0.387	2533
Income								
High	0.226	0.224	0.469	-0.052	0.264	0.079	0.521	2560
Medium-high	0.232	0.229	0.482	-0.058	0.292	0.104	0.540	5376
Medium-low	0.234	0.232	0.553	-0.110	0.274	0.096	0.663	4571
Low	0.219	0.225	0.576	-0.152	0.274	0.108	0.728	5972
Banking sector development								
High access	0.244	0.243	0.482	0.010	0.290	0.086	0.472	6135
Medium access	0.229	0.220	0.553	-0.058	0.275	0.101	0.611	6468
Low bank access	0.211	0.222	0.576	-0.152	0.266	0.097	0.728	5148
High depth	0.257	0.250	0.553	0.010	0.302	0.094	0.544	6163
Medium depth	0.221	0.224	0.576	-0.152	0.276	0.098	0.728	6233
Low depth	0.206	0.209	0.482	-0.110	0.253	0.088	0.592	5355
High efficiency	0.227	0.233	0.576	-0.110	0.271	0.090	0.686	6328
Medium efficiency	0.245	0.234	0.553	0.005	0.288	0.100	0.548	6052
Low efficiency	0.216	0.207	0.477	-0.152	0.282	0.096	0.629	5204
Low stability	0.229	0.219	0.553	0.008	0.272	0.099	0.545	3920
Medium stability	0.238	0.239	0.576	-0.010	0.273	0.075	0.586	3956
High stability	0.259	0.253	0.482	0.010	0.309	0.095	0.472	3908
All countries	**0.227**	**0.228**	**0.576**	**-0.152**	**0.278**	**0.101**	**0.728**	**18479**

*Quantiles computed for p=0.7, using the Rankit (Cleveland) definition.
Source: Authors' computations based on data from the IFS and the World Bank.
Notes: Range is defined as maximum minus minimum values. GDP per capita is classified according to the following criteria: high income (y>$8000), medium-high income ($7999<y<$3000), medium-low income ($2999<y<$1000), low income (y<$1000). Banking sector access is proxied by bank branches by 100,000 adults, depth is proxied by private credit to GDP (%); efficiency is proxied by interest rate spread and stability is proxied by bank nonperforming loans to gross loans (%). High, medium and low thresholds for financial market developments are determined by splitting the sample countries in three groups of equal sizes. All grouping criteria are applied to averages over 2001-2013.

Table A.4: Correlation between average A-BLC-to-TA and banking sector development proxies

	A-BLC	Access	Depth	Efficiency	Stability (a)	Stability (b)
A-BLC	1					

Access	0.077	1				
	0.046	-----				
Depth	0.207	0.399	1			
	0.000	*0.000*	-----			
Efficiency	-0.146	-0.161	-0.307	1		
	0.000	*0.000*	*0.000*	-----		
Stability (a)	-0.370	-0.113	-0.283	0.203	1	
	0.000	*0.003*	*0.000*	*0.000*	-----	
Stability (b)	-0.119	-0.141	-0.091	0.042	0.015	1
	0.002	*0.000*	*0.019*	*0.272*	*0.690*	-----

Sources: Authors' computations based on data from the World Bank Financial Development Indicators and IFS (IMF).
Notes: Reported correlations are based on averages over the period 2001-2013. P-values in italics, the probability is calculated under the null for the test statistics of zero correlation.. Banking sector access is proxied by bank branches by 100,000 adults, depth is proxied by private credit to GDP (%); efficiency is proxied by interest rate spread and stability (a) is proxied by bank nonperforming loans to gross loans (%); stability (b) is proxied by reserves-to-total assets by the banking sector.

Table A.5: Variables used in the construction of A-BLC

IMF: Other Depository Corporations Survey, national currency	
Variable	*Code*
Claims on Central Bank: Currency	FOSAAC_XDC
Claims on Central Bank	FOSAA_XDC
Claims on Central Bank: Other Claims on Central Bank	FOSAAO_XDC
Claims on Central Bank: Reserve Deposits And Securities other than Shares	FOSAAR_XDC
Claims on Other Sectors: Claims on Other Financial Corporations	FOSAOF_XDC
Claims on Other Sectors: Claims on Private Sector	FOSAOP_XDC
Claims on Other Sectors: Claims on Public Non-financial Corporations	FOSAON_XDC
Claims on Other Sectors: Claims on State and Local Government	FOSAOG_XDC
Claims on Other Sectors	FOSAO_XDC
Deposits Excluded from Broad Money	FOSDX_XDC
Financial Derivatives	FOSFD_XDC
Insurance Technical Reserves	FOSI_XDC
Liabilities to Central Bank	FOSLA_XDC
Loans	FOSL_XDC
Net Claims on Central Government: Claims on Central Government	FOSAG_XDC
Net Claims on Central Government: Liabilities to Central Government	FOSLG_XDC
Net Claims on Central Government	FOSG_XDC
Net Foreign Assets Claims on Non-residents	FOSAF_XDC
Net Foreign Assets Liabilities to Non-residents	FOSLF_XDC
Net Foreign Assets	FOSF_XDC
Other Deposits Included In Broad Money	FOSD_XDC
Other Items (Net)	FOSO_XDC
Securities other than Shares Excluded from Broad Money	FOSSX_XDC
Securities other than Shares Included In Broad Money	FOSS_XDC
Shares and other Equity	FOSE_XDC
Transferable Deposits Included In Broad Money	FOST_XDC
Total Gross Assets	FODAG_XDC

Source: International Financial Statistic, International Monetary Fund.

Table A.6 : A-BLC construction for China and India

Country	*Variable*	*Souce*	*Transformation*	*Sign of Weight*
China				
	Reserves	IFS, IMF	n/a	-
	Claims on other sectors	IFS, IMF	n/a	+
	Claims on NBFIs	IFS, IMF	n/a	-
	Demand deposits	IFS, IMF	n/a	+
	Bonds	IFS, IMF	n/a	-
	Credit from monetary autjority	IFS, IMF	n/a	+
	Liabilities to NBFIs	IFS, IMF	n/a	+
	Capital accounts	IFS, IMF	n/a	-
	Gross Total Assets	IFS, IMF	Sum of Claims on general government and Claims on other sectors	n/a
India				
	Reserves	IFS, IMF	n/a	-
	Claims on private sector	IFS, IMF	n/a	+
	Demand deposits	IFS, IMF	n/a	+
	Credit from monetary autjority	IFS, IMF	n/a	+
	Gross Total Assets	IFS, IMF	n/a	n/a

Notes: Data availability for China: 2001m12 - 2013m6. Data availability for India: 2012m12- 2013m3.
Source: International Financial Statistic, International Monetary Fund.

Table A.7: A-BLC-to-TA descriptive statistics by country groups and sub-periods

Panel A

Period: up to 2008m08	**Mean**	**Median**	**Max**	**Min.**	**Quant.***	**Std. Dev.**	**Range**	**Obs.**
Geographical Area								
Asia and Pacific	0.233	0.234	0.553	-0.152	0.287	0.115	0.705	2182
Latin America and Carribean	0.223	0.220	0.469	-0.032	0.281	0.108	0.501	1932
Africa and middle east	0.221	0.221	0.576	-0.110	0.259	0.100	0.686	2875
Offshore	0.217	0.232	0.467	-0.055	0.283	0.114	0.523	648
Europe	0.203	0.200	0.369	0.021	0.257	0.086	0.349	1140
Income								
High	0.220	0.223	0.469	-0.052	0.257	0.071	0.521	1221
Medium-high	0.224	0.222	0.469	-0.058	0.290	0.115	0.526	2495
Medium-low	0.227	0.224	0.553	-0.110	0.265	0.101	0.663	2207
Low	0.217	0.222	0.576	-0.152	0.271	0.111	0.728	2854
Financial markets development								
High access	0.237	0.241	0.469	0.010	0.280	0.087	0.459	2911
Medium access	0.226	0.212	0.553	-0.058	0.278	0.113	0.611	3173
Low bank access	0.205	0.212	0.576	-0.152	0.212	0.102	0.728	2477
High depth	0.262	0.252	0.553	0.010	0.307	0.096	0.544	3002
Medium depth	0.210	0.212	0.576	-0.152	0.265	0.110	0.728	2949
Low depth	0.196	0.196	0.446	-0.110	0.241	0.085	0.555	2610
High efficiency	0.221	0.227	0.576	-0.110	0.265	0.091	0.686	3078
Medium efficiency	0.244	0.235	0.553	0.005	0.298	0.109	0.548	2911
Low efficiency	0.208	0.198	0.477	-0.152	0.270	0.102	0.629	2490
Low stability	0.220	0.207	0.553	0.008	0.266	0.113	0.545	1846
Medium stability	0.232	0.236	0.576	-0.010	0.264	0.085	0.586	1857
High stability	0.255	0.247	0.469	0.010	0.312	0.097	0.460	1851
All countries	**0.222**	**0.223**	**0.576**	**-0.152**	**0.271**	**0.105**	**0.728**	**8777**

Sources: Authors' computations based on data from IFS and the World Bank.

Panel B

Period: after 2008m08	**Mean**	**Median**	**Max**	**Min.**	**Quant.***	**Std. Dev.**	**Range**	**Obs.**
Geographical Area								
Asia and Pacific	0.220	0.225	0.509	0.015	0.265	0.090	0.493	2366
Latin America and Carribean	0.247	0.226	0.482	0.044	0.307	0.101	0.439	2104
Africa and middle east	0.230	0.240	0.436	-0.129	0.281	0.094	0.565	3186
Offshore	0.215	0.214	0.548	-0.026	0.273	0.138	0.574	636
Europe	0.245	0.247	0.408	0.048	0.295	0.069	0.359	1386
Income								
High	0.232	0.224	0.453	0.074	0.283	0.086	0.379	1338
Medium-high	0.239	0.235	0.482	0.011	0.294	0.093	0.471	2872
Medium-low	0.240	0.242	0.509	-0.071	0.281	0.090	0.580	2357
Low	0.221	0.230	0.548	-0.129	0.278	0.105	0.677	3111
Financial markets development								
High access	0.250	0.245	0.482	0.053	0.294	0.085	0.429	3250
Medium access	0.233	0.228	0.509	0.011	0.275	0.089	0.498	3327
Low bank access	0.217	0.231	0.436	-0.071	0.276	0.092	0.506	2698
High depth	0.253	0.247	0.509	0.053	0.296	0.091	0.456	3193
Medium depth	0.232	0.233	0.436	0.011	0.285	0.085	0.424	3306
Low depth	0.216	0.224	0.482	-0.071	0.262	0.090	0.553	2776
High efficiency	0.232	0.239	0.482	-0.071	0.279	0.088	0.553	3283
Medium efficiency	0.247	0.234	0.509	0.031	0.285	0.091	0.478	3170
Low efficiency	0.224	0.222	0.409	0.011	0.291	0.089	0.398	2736
Low stability	0.238	0.231	0.509	0.031	0.277	0.085	0.478	2064
Medium stability	0.243	0.242	0.436	0.075	0.281	0.065	0.361	2098
High stability	0.263	0.255	0.482	0.048	0.307	0.094	0.434	2049
All countries	**0.232**	**0.233**	**0.548**	**-0.129**	**0.284**	**0.096**	**0.677**	**5530**

Sources: Authors' computations based on data from IFS and the World Bank.

Table A.8: IFRS-complying countries

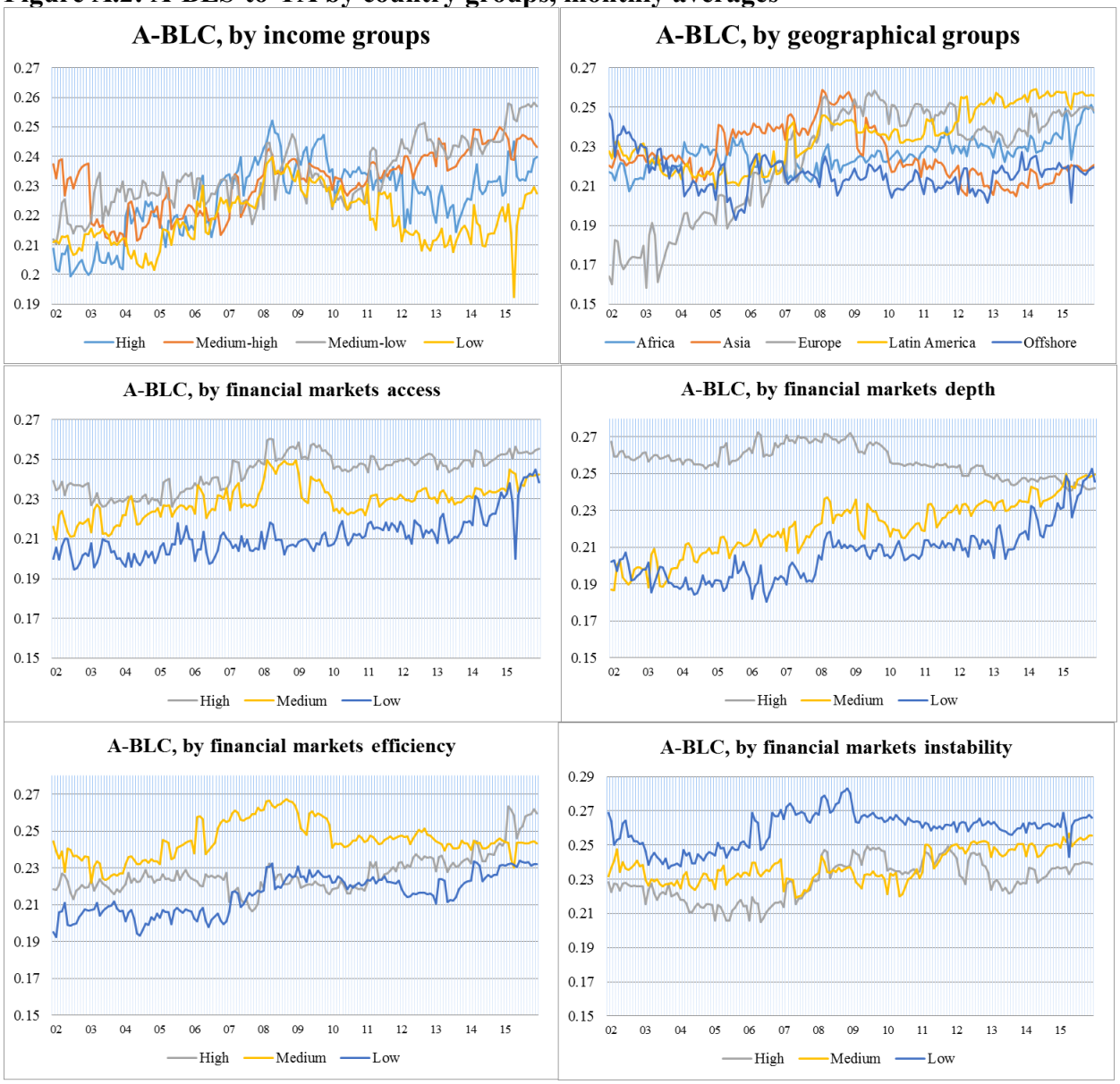
Specification	(a)		(b)	
	Coefficient	t-stat	Coefficient	t-stat
ABLC(-1)	0.580***	30,850	0.545***	28,543
y	0.049***	2,395	0.050**	2,289
ir	-0.056***	-4,289	-0.067***	-5,183
er	0.009	1,459	0.009	1,310
fdi	0.003***	7,399	0.003***	6,612
sfr	-0.011***	-3,966		
brw			0.329***	2,837
Country fixed effect	Yes		Yes	
Period fixed effect	Yes		Yes	
No. observations	921		921	
No. of cross sections	82		82	
Sargant Test (p-value)	0,419		0,406	
AR(2) (p-value)	0,542		0,817	

Notes:***, **, * respresents 1, 5 and 10% significance level respectively. The t-statistics are based on White heteroskedasticity-consistent standard errors. All regressions were estimated over the 2003-15 time frame. Time effect coefficients are not reported.

Figure A.1: A-BLC-to-TA, banking sector development and income (2001-2013 averages)

Source: Authors' computations based on data from the World Bank Financial Development Indicators and IFS.
Notes: Banking sector access is proxied by bank branches by 100,000 adults; depth is proxied by private credit to GDP (%); efficiency is proxied by interest rate spread and stability is proxied by bank nonperforming loans to gross loans (%).

Figure A.2: A-BLS-to-TA by country groups, monthly averages



Source: Authors' computations based on data from the World Bank Financial Development Indicators and IFS.
Notes: GDP per capita is classified according to the following criteria: high income (y>$8000), medium-high income ($7999<y<$3000), medium-low income ($2999<y<$1000), low income (y<$1000). Financial markets access is proxied by bank branches by 100,000 adults, financial markets depth is proxied by private credit by deposit money banks to GDP (%); efficiency is proxied by bank return on assets (%, after tax) and financial markets stability is proxied by bank nonperforming loans to gross loans (%). High, medium and low thresholds for financial market developments are determined by splitting the sample countries in three groups of equal sizes.