

Determinants of Non-Core Liabilities of Banks in Emerging Markets in the Post-Crisis Era¹

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Abstract

The level of the non-core liabilities of the aggregate banking sector serves an indicator of systemic risk in an interconnected banking system. In this paper, we disentangle the non-core liabilities of the banking system of four selected emerging markets into demand-pull and supply-push components from 2004 to 2015. Our results from structural vector autoregressions imply that, in the wake of the crisis, worsening demand conditions in the recipient countries were the main determinants of the decline in cross border flows. However, once the unconventional policy measures by the advanced economies were put into effect, the proliferation of global liquidity worked as a push factor for cross border flows. Moreover, after the FED's tapering signal in mid-2013, country-specific macroprudential tools in emerging economies determined the direction of capital flows to these economies. Our results provide valuable information regarding the appropriate design of countercyclical macroprudential policies.

Keywords: Financial stability, capital flows, non-core liabilities.

JEL Classification: C32, E44, G21.

Küresel Finansal Kriz Sonrası Dönemde Gelişmekte Olan Ülkelerdeki Bankaların Çekirdek Olmayan Yükümlülüklerinin Belirleyicileri

Özet

Bankacılık sektörünün toplam çekirdek dışı yükümlülükleri bu sektörün sistemik riski için önemli bir göstergedir. Çalışmamız, 2004-2015 dönemi ve dört farklı gelişmekte olan ülke için bankacılık sisteminin çekirdek olmayan yükümlülüklerinin değişimlerini talep ve arz kaynaklı bileşenlerine ayırmaktadır. Yapısal vektör oto-regresyon analizinden elde edilen sonuçlar, küresel finansal kriz ile birlikte gelişmekte olan ülkelere yaşanan talep düşüşünün bu ülkelere sermaye akımını ve bu ülkelerdeki bankaların çekirdek dışı yükümlülüklerini azalttığını, bu krizi takiben gelişmiş ülkelerin uyguladığı geleneksel olmayan para politikalarının ise bunun tersi bir etki yaptığını göstermektedir. Ayrıca, 2013 yılı ortalarında Amerikan Merkez Bankası'nın parasal genişlemeyi azaltmaya başlamasının ardından, gelişmekte olan ekonomilerde ülkelere özgü makroihtiyati

¹ The views expressed in this study are those of the authors and do not necessarily represent the official views of the Central Bank of the Republic of Turkey.

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araçlar bu ekonomilere yönelen sermaye akımlarının yönünü belirlemiştir. Sonuçlarımız, döngü karşıtı makroihtiyati politikaların uygun tasarımına ilişkin bilgi sunmaktadır.

JEL Sınıflandırması: C32, E44, G21.

Anahtar Kelimeler: Finansal istikrar, sermaye akımları, çekirdek dışı yükümlülükler.

The post-crisis era reveals a faster recovery in credit growth for emerging markets as opposed to that in advanced countries (Figure 1). A significant cause of the rapid recuperation in credits in emerging markets is the surge in indirect cross-border capital flows to these economies². This study asks whether the main determinant of the rise in cross-border flows is the *global liquidity* or increasing *domestic demand* in emerging countries. Our particular focus in this study is on the liabilities side of the balance sheet of the banking sector, in particular the *non-core liabilities* of the aggregate banking sector, which serves as an indicator of systemic risk in an interconnected banking system (Shin and Shin, 2011; Hahm et al., 2013). As the argument goes, during normal times, banks finance their lending through *core* liabilities, such as demand and time deposits of the *household sector*. These are reliable and relatively stable sources of funds for banks. Moreover, the growth rate of these deposits is usually consistent with that of the household wealth during the economic cycle. However, during booms, when loan demand growth exceeds that of the deposits, banks might resort to other, less reliable and more volatile sources of funds such as short-term foreign debt or interbank borrowing, from *other financial institutions*. A rise in these *non-core* liabilities in the balance sheet of banks indicates vulnerability against liquidity shocks for two reasons. First, as a result of their short-term nature and unreliability, it would be hard to rollover these funds during a liquidity squeeze. Second, and more importantly, enhanced cross-lending between domestic banks increases the systemic risk due to the contagion effect stemming from bilateral exposures.

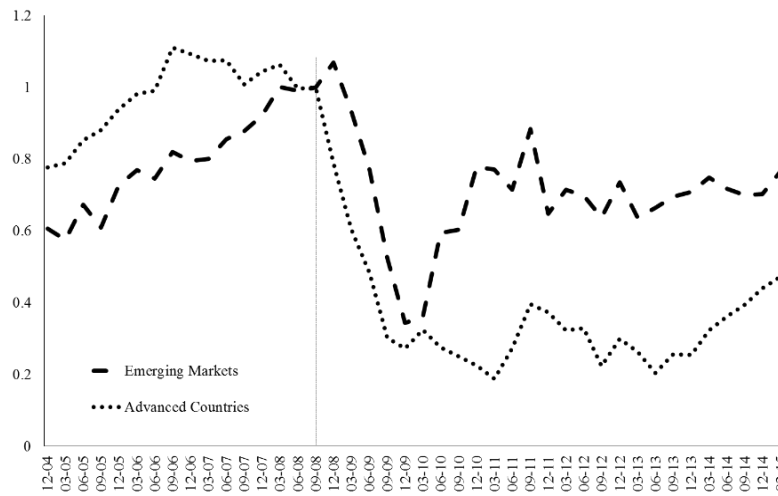
As the analysis in the previous paragraph suggests, non-core liabilities provide a good indicator for the procyclical risk-taking behaviour of banks in an era of intense cross-border flows³. Moreover, movements in non-core liabilities are strongly linked with movements in domestic credit growth for many emerging markets (Figure 2). This strong relationship is documented by Pontinez and Siregar (2017) for Indonesia; by Kılınç et al. (2013), Akdoğan and Yıldırım (2014) and Demirölmez (2017) for Turkey⁴. From this standpoint, some emerging markets, like Korea and Turkey, have conducted macro-prudential policies that encourage the banks to extend the maturity of their non-core liabilities. Our paper argues that the design of such policies requires a true assessment of the determinants of the movements in these flows, in particular having origins in domestic economy or global liquidity conditions. To further explain our motivation, one must assume that there is an increase in non-core liabilities which resulted in higher credit growth. If this increase is due to domestic demand conditions, then an increase in policy rate would serve to curb domestic demand and might act as a countercyclical tool. However, provided that global liquidity is the main determinant of the surge in non-core liabilities, an increase in policy rate might result in attracting more capital from the rest of the world, hence exacerbating the problem.

² The direct capital flows refer to the credits extended to the domestic private agents by foreign financial institutions. The indirect channel describes an intermediary, usually a bank, raising wholesale funding from abroad and then lending to local customers. Borio et.al (2011) shows that both channels functioned well for emerging markets after the global financial crisis due to the permissive global financial conditions, raising concerns for domestic authorities.

³ Haan et al. (2020) shows that banks prefer holding more non-core liabilities, fewer assets and to have higher leverage during booms.

⁴ The relationship between non-core liabilities and credit volume is quite weak only for Brazil in the pre-global financial crisis era. Yet, the post-crisis era witnesses some periods where the two series display a significant positive relationship (the correlation in the shaded region is much higher than that of the rest of the period).

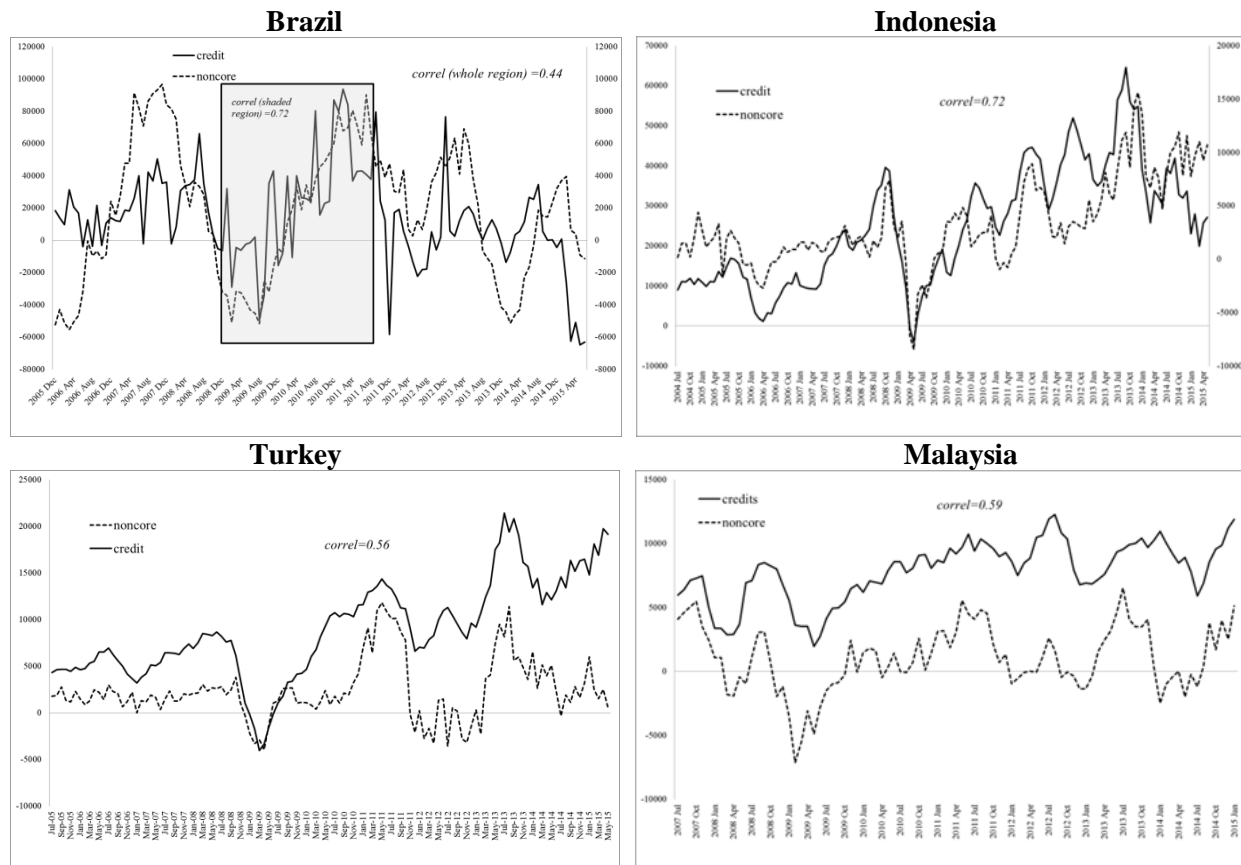
Figure 1 Change in total credits / GDP
(q-o-q change, 4- quarters moving average, indexed as 2008Q3=1)



Notes: i) Advanced countries include Australia, Austria, Belgium, Denmark, Finland, France, Greece, Ireland, Malta, Singapore, Spain, Switzerland, UK and USA. Emerging markets include Brazil, Chile, Croatia, Czech Republic, Hungary, Indonesia, Malaysia, Mexico, Poland, Russia, South Africa, Thailand, Turkey and Ukraine. ii) Total credit figure is the total credits extended to the private sector which is the sum of household credits and business credits for each country. Source: Central banks and/or government statistical agencies.

Figure 2 Non-core Liabilities and Total Credit, Brazil

Change and Billions of domestic currency for all countries
For Brazil and Indonesia; Left: Non-core liabilities, Right: Total credit, 6-months average. For Malaysia and Turkey; 3-months average.



Source: Central Bank Web Sites

We decompose the movements of non-core liabilities of the banking sector into their demand-pull and supply-push components for four emerging economies: Brazil, Indonesia, Malaysia and Turkey. The reason for limiting our sample with four countries stems from the availability of data. In general, non-core liabilities are defined as the sum of the liabilities of the banking sector to the foreign sector and liabilities of the banks to other domestic financial corporations. However, the historical data on non-core liabilities was not publicly available at the time of this study and was instead extracted from the aggregate banking sector statistics⁵. Moreover, and more importantly, this definition is not applicable to all countries due to the different characteristics of the banking sectors. Consequently, among a larger group of emerging markets, including Mexico, Nigeria, South Africa, Thailand and Ukraine, we managed to construct the relevant data for the four countries mentioned above. The data appendix provides a detailed definition of the construction of non-core liabilities for these countries.

The demand/supply decomposition is carried out by means of vector autoregressions with sign restrictions, using the framework proposed by Kim et al. (2013). In a two-variable VAR model, we employ non-core liabilities as the *quantity* variable and money market rate as the *price* variable. Demand shocks, which stem from changes in domestic demand conditions, are defined as those that move quantity and price variable in the *same* direction. Supply shocks, which are related with liquidity conditions, are supposed to move quantity and price variables in *opposite* directions.

Our results suggest two important features of the cross-border flows in the aftermath of the global financial crisis. First, the initial decline in non-core liabilities after the crisis is mainly demand-driven for most countries in our sample. However, the impact of quantitative easing reveals itself with a more pronounced supply-led growth in cross-border flows almost two years after the crisis. This result implies that in the wake of the crisis, worsening demand conditions in the recipient countries and the high levels of uncertainty were the main determinants of the drop in capital flows towards these countries. However, once the unconventional policy measures by the advanced economies were taken in, the proliferation of global liquidity worked as a push factor for capital flows into emerging markets.

Second, after the tapering signal in mid-2013, as capital inflows start to decline, the negative supply-push impact can be observed through outflows in all countries in our sample. However, it should be noted that, for Indonesia and Turkey, following the tapering signal, the positive demand-pull component of the movements in non-core liabilities offsets this negative supply push impact. That heterogeneity among countries underscores the need to take into account the differences in the prevailing domestic market conditions while carrying out countercyclical policy responses in emerging markets. Along this line of reasoning, we further examine the relationship of the movements in non-core liabilities with the macroprudential measures taken by our sample countries.

Our study contributes to alternative strands of the literature in several respects. First, while the literature, almost exclusively, agrees on the raised macro-financial risks on emerging markets induced by intense capital inflows to these economies, the appropriate channel that would be used

⁵ After the global financial crisis, the IMF began to compile new statistics on financial stability, which could be accessed under non-standardized presentation heading in IMF statistics. Nevertheless, the time coverage was very short for these statistics, especially for the emerging markets when the analysis of this study was undertaken.

to conduct countercyclical policies is still a subject of ongoing debate⁶. A part of the literature examines the impact of *capital controls* on volatility of capital flows⁷ (Ghosh et al., 2014; Bruno et al., 2015), while some studies focus directly on the *housing market* to prevent mortgage credit booms (Kuttner and Shim, 2012; Zhang and Zoli, 2014). Akıncı and Rumsey (2015) suggest that capital control policies targeting the *banking sector* are more successful than portfolio restrictions on curbing credit growth. Along this last line of thought, our paper suggests that non-core liabilities would provide timely information on systemic risk which accumulates through the banking sector during expansionary times, provided that their determinants are properly assessed.

A second group of study focuses on the macroprudential policies according to alternative dimensions of the systemic risk (Borio, 2010). On the one hand, countercyclical buffers concentrate on the *time* dimension, i.e. the behaviour of the systemic risk over time. On the other hand, the accumulation of risk in the overall financial sector at a particular moment (e.g. the correlation of exposures under alternative network structures) is monitored by policy tools that are designed to capture the *cross-sectional* dimension. Among alternative macroprudential tools (such as market-based indicators, early warning indicators or the macro stress testing approach) one group that stands out in terms of simplicity and granularity is that of balance sheet indicators⁸. Non-core liabilities, as a part of this group, provide information on both the cross-sectional dimension (the balance sheet interlinkages within the financial system in a systemic breakdown) and time dimension (stability concerning the reliability of the banks' liabilities under different periods of the economic cycle). Our paper suggests that the information on time dimension should be evaluated based on the source of the change in non-core liabilities during alternative phases of the cycle.⁹

A third dimension that we focus on is the evolution of the post-crisis transmission mechanism in the financial system due to the *self-reinforcing link between liquidity and risk-taking* (Borio and Zhu, 2012 pg. 237). As the argument goes, weakening liquidity constraints might increase risk-tolerance and lead investors to borrow for higher-risk projects. The resulting *liquidity multiplier* has a strengthening effect on the monetary policy transmission mechanism. Nevertheless, liquidity is still an elusive concept that is hard to measure and even harder to endogenize in models explaining the transmission mechanism. This shortcoming further highlights the importance of using monetary and macro-prudential tools in tandem when necessary. Our paper underlies the importance of differentiating the liquidity impact from domestic conditions, which is a prerequisite of this multifaceted framework.

In line with the argument above, Kim et al. (2013) provide a similar decomposition for Korean non-core liabilities. Our paper differentiates from this paper in some important respects. First, we extend the analysis to four more emerging markets. Second, we hold a different view on

⁶ The post-crisis period has witnessed the introduction of many novel macro-prudential policy tools designed for the era of abundant global liquidity, as well as the traditional ones. Remarkably, most of these policies were conducted by emerging markets which encounter stronger economic and financial cycles compared to the advanced countries, partially due to the intensity and the volatility of the capital flows (Claessens et al., 2013). Recently, a documentation of macroprudential policies conducted by 119 countries based on an IMF survey points out a positive relationship between the implementation of macroprudential policies and intensity of cross-border funding (Cerutti et al., 2015).

⁷ There are also studies (Forbes and Warnock 2012 or Binici et al. 2014) which find a partial or no effect for policies implying some form of capital control on the volatility of capital flows.

⁸ Borio and Drehman (2009) and Galati and Moessner (2010) provide a review of these different indicators under different macroprudential policy frameworks.

⁹ Non-core liabilities are one of the different measures to monitor systemic risk. The post-GFC period witnessed the introduction of different measures and ratios for this purpose as well. A study of the IMF (Blancher et al., 2013) documents these alternative measures to monitor system-wide risks in the banking sector.

the treatment of the non-core data. An increase in the demand-pull component would increase both domestic and foreign components of the non-core liabilities. By definition, the supply-push factor has a greater influence on foreign borrowing compared to the domestic factor at the first instance. However, the increase in global liquidity would also imply more funds in the domestic market per se. Hence, some of the foreign flows that could not be allocated as credits would lead to an increase in available funds in the domestic interbank market which, in turn, would increase the interbank market transaction volume. Hence, we prefer to conduct our analysis with the total non-core liabilities measure instead of separating it into its domestic and foreign components as in Kim et al. (2013). Note that the ratio of the domestic component to the non-core liabilities reaches up to 57 percent in Malaysia. Finally, we also relate the implications of our findings to the macroprudential policies conducted by our emerging markets.

The paper is structured in four sections. The next section describes the data and methodology. The third section documents the results of our empirical analysis. The fourth section provides a discussion of the implications of our results on the countercyclical macroprudential policies conducted by emerging markets. The fifth section concludes.

Data and Methodology

Data

Our data covers non-core liabilities of Brazil, Indonesia, Malaysia and Turkey for different periods between 2004 and 2015. The data is adjusted for the foreign exchange rate. The details on sub-items are provided in the data appendix.

Non-core liabilities consist of a domestic component of which the biggest portion is the interbank lending, and a foreign lending component. The ratios of the domestic component to the noncore liabilities vary for each country: Indonesia 14 percent, Malaysia 57 percent and Turkey 38 percent. The Brazil data only includes foreign liabilities since aggregate banking sector statistics for interbank lending is not available. The price variables are money market rates that capture the tightness of credit markets and are taken from the IMF-IFS database.

Methodology

In order to decompose the total non-core liabilities of our sample countries into their demand-pull and supply-push components, we set up a structural vector autoregression (*SVAR*) model. This model defines the relationship between non-core liabilities (*ncl*) and money market rate (*mmr*) as follows (the model uses yearly growth rates of the variables to ensure their stationarity):

$$A \begin{pmatrix} \Delta ncl_t \\ \Delta mmr_t \end{pmatrix} = B_0 + B \begin{pmatrix} \Delta ncl_{t-1} \\ \Delta mmr_{t-1} \end{pmatrix} + \begin{pmatrix} v_{1,t} \\ v_{2,t} \end{pmatrix}, \quad (1)$$

which, in an explicit form, can be written as¹⁰

¹⁰ For the sake of demonstration, Equations (1) and (2) use only the first lag of variables on the right hand side of these equations. In the application, we determine the optimal lag length based on the majority rule using several lag-length criteria like AIC, SC and HQ criteria.

$$\begin{pmatrix} 1 & a_{12} \\ a_{21} & 1 \end{pmatrix} \begin{pmatrix} \Delta ncl_t \\ \Delta mmr_t \end{pmatrix} = \begin{pmatrix} b_{10} \\ b_{20} \end{pmatrix} + \begin{pmatrix} b_{11} & b_{12} \\ b_{21} & b_{22} \end{pmatrix} \begin{pmatrix} \Delta ncl_{t-1} \\ \Delta mmr_{t-1} \end{pmatrix} + \begin{pmatrix} v_{1,t} \\ v_{2,t} \end{pmatrix}. \quad (2)$$

According to Equation (2), each variable is affected by the current value of the other variable, the lag of itself, and the lag of the other variable. In essence, Equation (2) shows the endogenous relationship between the price of a variable and its quantity. Since the model in (2) relates current values of an endogenous variable to the current values of other endogenous variables, it is a structural model and v_t shocks are the structural shocks. Even though there can be many elements within v_t shocks, these elements can be broadly classified as demand and supply shocks. In that regard, following Kim et. al (2013), we define demand shocks as those that move the quantity of the monetary aggregate and price in the same direction. In contrast, supply shocks are those that move the quantity and price in opposite directions.

Equation (2) cannot be directly estimated due to the endogeneity problem. To overcome this problem, we first collect the variables in (2) into a Y vector:

$$AY_t = B_0 + BY_{t-1} + v_t, \quad (3)$$

where $Y = [\Delta ncl, \Delta mmr]'$. Next, we multiply both side of Equation (3) by the inverse of the A matrix:

$$A^{-1}AY_t = A^{-1}B_0 + A^{-1}BY_{t-1} + A^{-1}v_t. \quad (4)$$

When rearranged, Equation (4) can be written as:

$$Y_t = F_0 + FY_{t-1} + e_t, \quad (5)$$

where F_0 denotes $A^{-1}B_0$ multiplication matrix, F denotes $A^{-1}B$ multiplication matrix, and finally e_t denotes $A^{-1}v_t$ multiplication matrix.

Equation (5) explains the current realization of the variables with their lags so can be estimated via reduced form estimation techniques. Yet, as it can be seen by comparing Equations (4) and (5), the e_t shocks that are obtained from this equation show the total effect of both the demand and supply shocks:

$$\begin{pmatrix} e_{1,t} \\ e_{2,t} \end{pmatrix} = \begin{pmatrix} 1 & a_{12} \\ a_{21} & 1 \end{pmatrix}^{-1} \begin{pmatrix} v_{1,t} \\ v_{2,t} \end{pmatrix}. \quad (6)$$

To obtain the supply and demand shocks (v_t 's) from e_t 's we need to impose restrictions on the A^{-1} matrix. To do that, we first obtain the impulse responses of the model. In that regard, Equation (6) can be written as

$$e_t = A^{-1}v_t. \quad (7)$$

Combining equations (5) and (7), we find

$$Y_t(1 - FL) = F_0 + A^{-1}v_t, \quad (8)$$

where L denotes the lag operator. Equation (8) can be rearranged as

$$Y_t = \frac{F_0}{(1-FL)} + \frac{A^{-1}v_t}{(1-FL)}, \quad (9)$$

which can further be written as

$$Y_t = c + A^{-1}v_t + FA^{-1}v_{t-1} + F^2A^{-1}v_{t-2} + \dots \quad (10)$$

where c represents the constant term in Equation (9). Equation (10) decomposes the series in Y_t into their means (which is the vector c) plus the effects of current and past realizations of the structural shocks. The coefficients of this equation show the impulse responses of the variables in the Y_t vector to a unit change in structural shocks. Since the F matrix is obtainable from Equation (5), any restriction on these impulse responses helps us to identify the elements of the A^{-1} matrix. The A^{-1} matrix further can be used in Equation (6) to obtain the elements of v_t 's, which are the realization of the structural shocks.

To obtain A^{-1} , we impose *sign restrictions* on the coefficients of (10) that are impulse responses of the model.¹¹ These restrictions define demand shocks as those that move the quantity of the monetary aggregate and price in the same direction. In contrast, supply shocks are those that move the quantity and price in opposite directions¹².

Equation (10) further shows that at any moment the deviations in the series in the Y_t vector can be partitioned to the current and past realizations of the shocks in v_t . Given that we obtained the elements of F , A^{-1} and v_t matrix, we can construct the historical contributions of supply and demand shocks to the deviations in total non-core liabilities of sample countries¹³.

Results

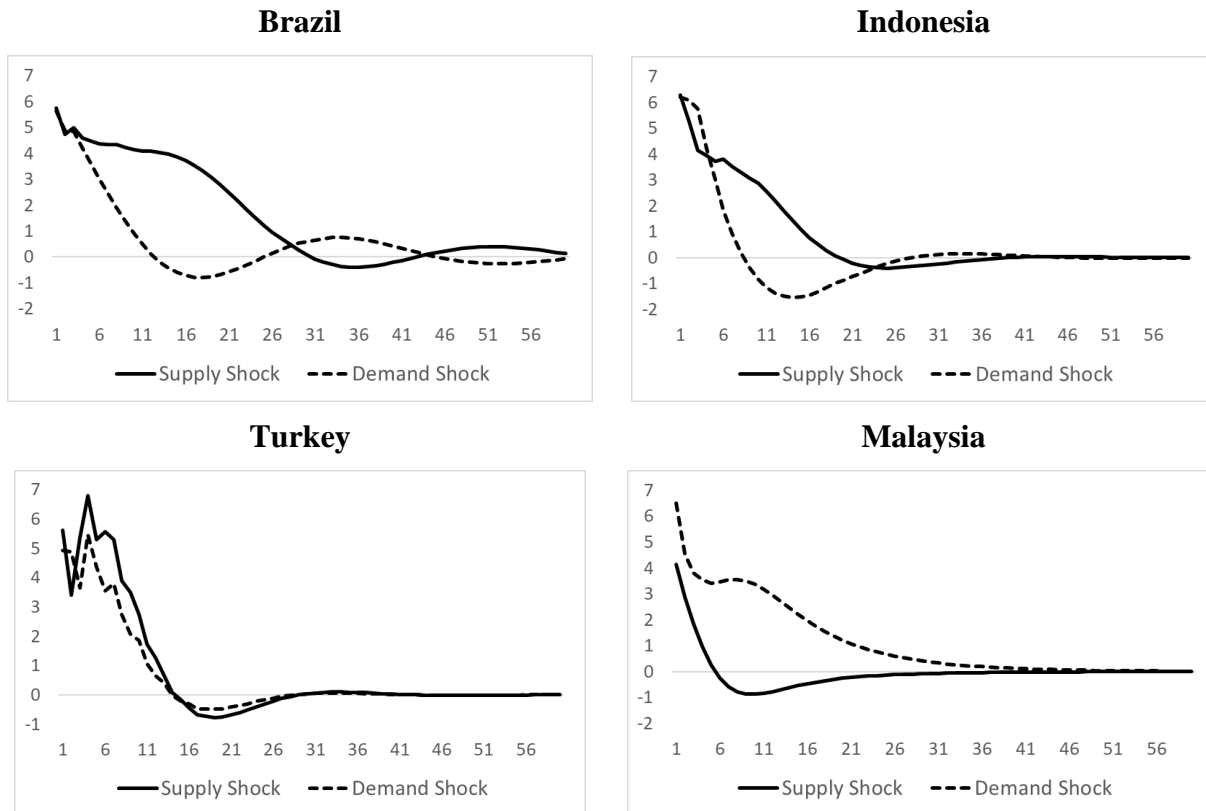
Figure 3 displays the percentage change in non-core liabilities in response to supply and demand shocks for each country in our sample. The responses of non-core liabilities in the initial period following the shocks are similar across countries and change between 4 to 7 percent. A careful look at the figures suggests that the effect of supply shock dies out quicker than that of the demand shock in Malaysia whereas the opposite holds in Brazil and Indonesia. Hence, we conclude that the demand (supply) shocks are more effective than the supply (demand) shocks in Malaysia (in Brazil and Indonesia). In Turkey, on the other hand, the effects of supply and demand shocks disappear almost concurrently.

The analysis discussed above merely explains the effect of unit demand and unit supply shocks. To explore the comparable effects of the demand and supply shocks on the level of non-core liabilities, we further study the realizations of these two shocks in the remaining parts of this section.

¹¹ Sign restriction constructs different decompositions of variance-covariance matrix of VAR residuals and saves the ones satisfying the restrictions imposed on the impulse responses, given that the variance-covariance matrix of structural shocks is normalized to an identity matrix. We use 500 draws; hence, this analysis obtains a distribution of 500 solutions. Median values of these solutions are used as parameter estimates.

¹² For estimation details, see "Ambrogio Cesa-Bianchi, 2014. "VAR Toolbox", sites.google.com/site/ambropo/".

¹³ To note, the historical decomposition uses the Wold decomposition, which assumes that the value of any stationary stochastic series at time t can be written as the value of the series at time 0 plus the cumulative of shocks to the series from time 0 to time t . In our bivariate VAR context, the series is partitioned into two structural shocks.

Figure 3 Impulse Response Functions of Non-core Liab. to Supply and Demand Shocks

Notes: The figures reveal the percentage changes in non-core liabilities.

Figures 4 to 7 plot the historical decomposition of the non-core liabilities of the aggregate banking sector into the demand and supply components. The figures include the mean-difference of the non-core liabilities for each country (the straight line), the demand-pull component (the light bars) and the supply induced component (the dark bars)¹⁴.

We divide the data sample into four regions for each country. The first one is the pre-global financial crisis region, starting with the initial data point of the corresponding country and ending with the collapse of Lehman brothers in September 2008¹⁵. Hence, we concentrate on the post-crisis era. The only noticeable pattern in the pre-crisis era comes from Brazilian data, which shows that there is significant growth in the non-core liabilities and supply side shocks are mainly responsible from this growth. Yet, for Brazil the relationship between non-core liabilities and credit volume is quite weak in the pre global financial crisis era (see Figure 2). As a result, we do not examine this period any further.

¹⁴ Since we compose the mean deviations in the data to the demand pull and supply induced components, the sum of these two components should add up to the data itself, except for the initial periods. This is because in the initial periods we do not have the past realizations of the shocks. Hence, we are not able to decompose the series into the past realization of shocks. Once we move further away from the initial periods, the effect of the initial values will die off and historical decompositions will sum up to the value of the series.

¹⁵ In this region, as explained in the footnote above, the historical decompositions do not add up to the data itself. Moreover, Malaysian data is not available for this period.

Figure 4 Historical decomposition of the y-o-y growth in non-core liabilities, Brazil

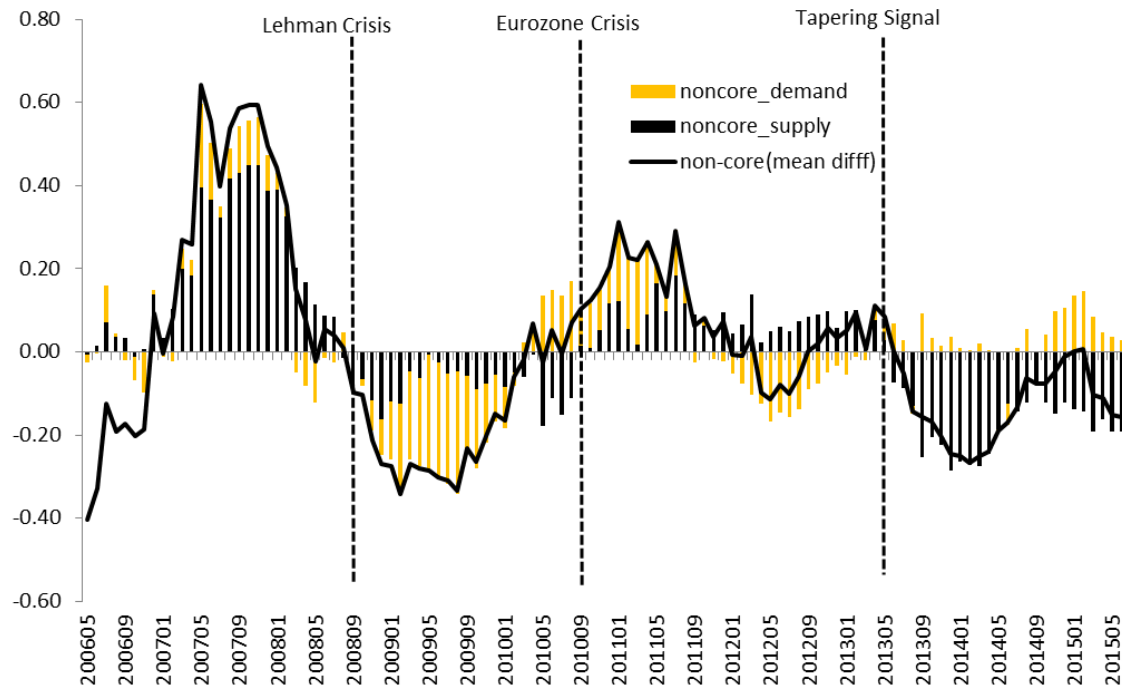


Figure 5 Historical decomposition of the y-o-y growth in non-core liabilities, Indonesia

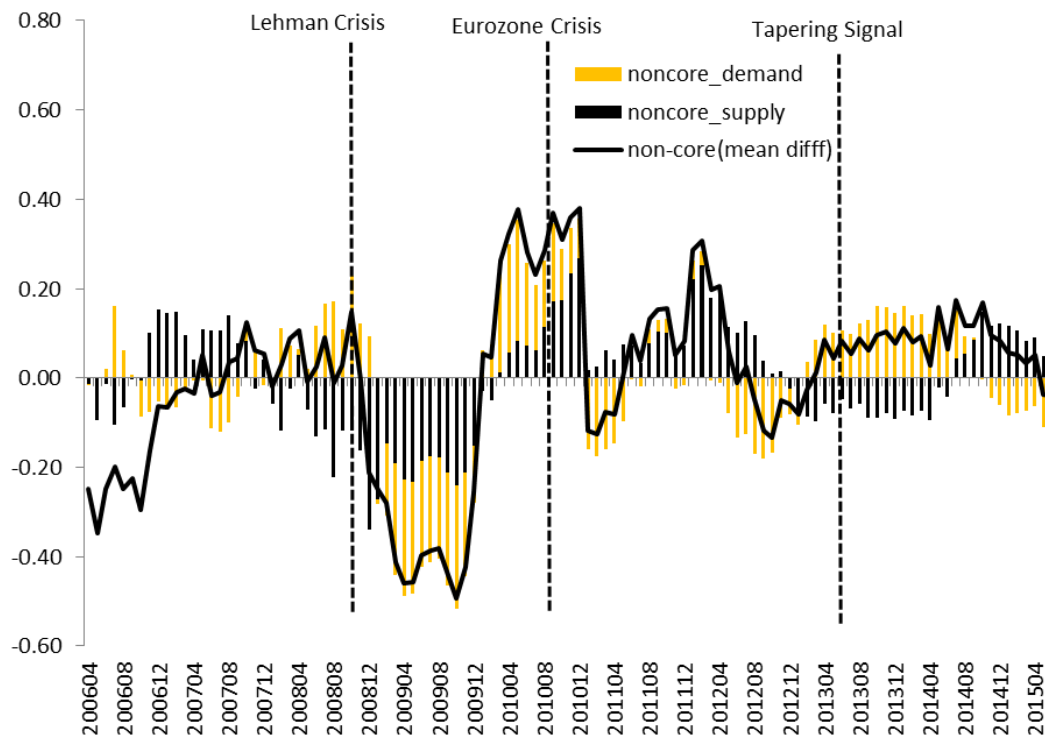
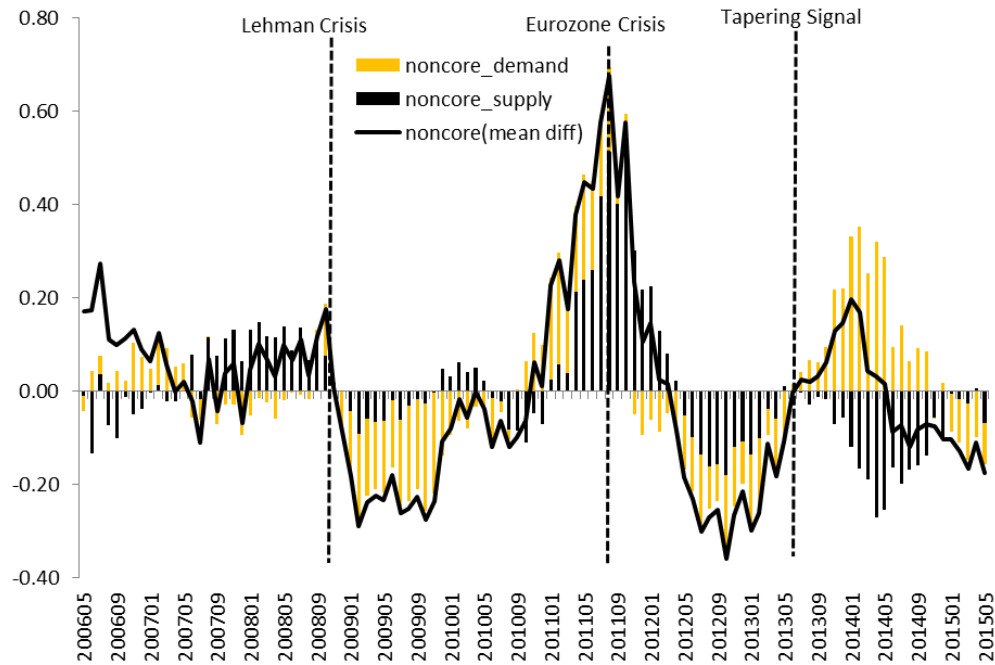
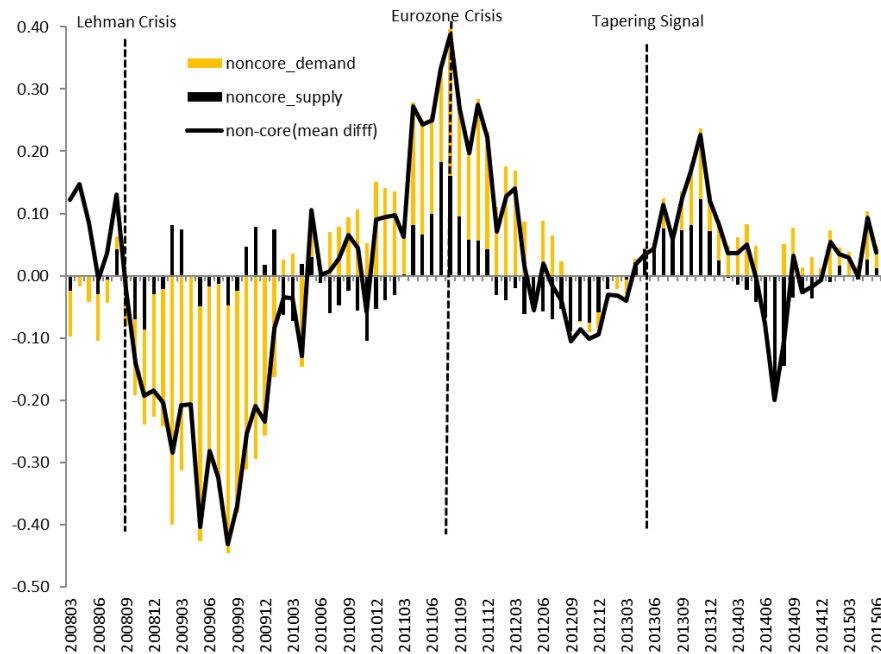


Figure 6 Historical decomposition of the y-o-y growth in non-core liabilities, Turkey**Figure 7** Historical decomposition of the y-o-y growth in non-core liabilities, Malaysia

The second region covers the crisis period up until the peak of the Eurozone crisis in August 2010. The third region includes dates following August 2010 and ends at the tapering signal of the FED. The data show similar patterns among countries in these two periods. The initial phase of the crisis remarks a plunge in non-core liabilities for all countries. That immediate decline is a

combination of both supply and demand shocks; however, the demand-driven part dominates for almost all countries. This phenomenon is mainly an outcome of simultaneous impacts of the crisis and immediate responses of the policy authorities. During the crisis both uncertainty and the risk-aversion of economic agents goes up, which would result in less demand for credit.

The recovery starts at least a year after the crisis and then continues until the deepening of the Eurozone crisis in all countries. For Malaysia and Turkey, the turning points of the series match exactly with the end of our region in August 2010 (dotted line), while Brazil and Indonesia display a lag of a couple of months. That recuperation is initially driven by partially improving expectations (demand-side). That common movement in demand also reveals that the expectations for these countries share common global components. Note that, these improvements in expectations are not simultaneous with the global liquidity impact. The graphs reveal that the supply induced part of the recovery (positive dark bars) is rather more noticeable in two years' time after the crisis, for all countries. Interestingly, while the quantitative easing policies conducted by the advanced country central banks started immediately after the crisis, their impact on capital flows is only observable starting with the first quarter of 2011 for Brazil, Malaysia, Turkey; and a one quarter before in Indonesia. Hence, our results imply that the improvement in expectations (demand side) is revealed before the supply side impacts of the quantitative easing policies (positive dark bars) are observable in capital flows¹⁶.

Table 1 The share of supply shocks in total (absolute value) of shocks

	Total	Before Lehman Brothers (Beginning of the country data to Sep. 2008)	Between Lehman and Eurozone Crisis (Sep. 2008-Aug. 2010)	Between Eurozone Crisis and Tapering Signal of FED (Aug. 2010-May. 2013)	After Eurozone Crisis (After May. 2013)
Brazil	60.0	75.4	35.9	49.0	74.9
Indonesia	49.5	55.8	45.1	54.3	42.8
Malaysia	30.8	28.1	17.4	37.2	51.2
Turkey	54.0	54.7	34.4	67.3	47.0

The Malaysian data shows a distinctive pattern, which is that compared to the other countries in our sample, the demand shocks are much more pronounced than the supply shocks. This is consistent with impulse responses in Figure 3, which shows that the effect of unit supply shock is much smaller in Malaysia compared to other countries. The next section discusses how in Malaysia the domestic banks became less reliant on interbank and wholesale funding after the Asian financial crisis of 1997, which could explain the dominance of demand side shocks in this country.

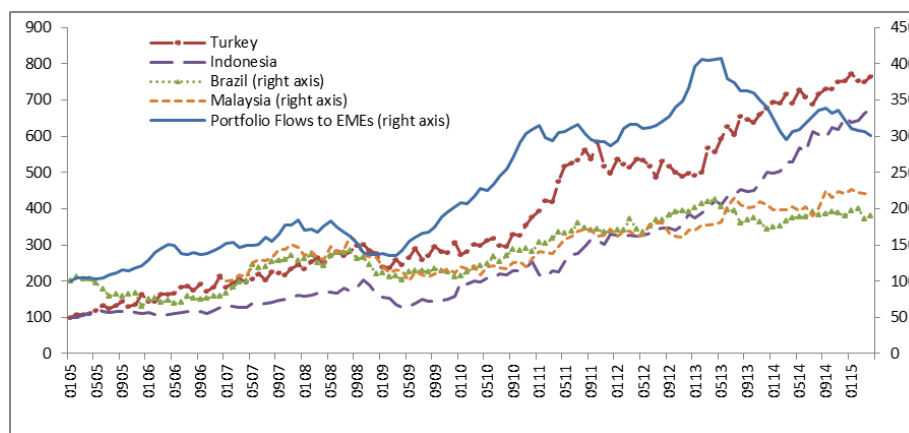
The global liquidity impact (positive dark bars) is noticeable for Brazil up until the tapering signal of the US FED in 2013; while for the rest of the countries, this global supply effect starts to wane in the first quarter of 2012. The global supply effect is more negative after the tapering signal for all countries, except Malaysia which decouples from the group for a brief period after May

¹⁶ Table 1 reports the share of the supply shocks in total shocks (in absolute value).

2013. The fourth region in Figures 4-7 includes dates following the tapering of the FED and ends at the last data point of each country. In order to understand the heterogeneity in these countries after the tapering signal of the US FED in May 2013, we first depict the portfolio flows to emerging markets and non-core liabilities in Figure 8¹⁷. The figure suggests that the non-core bank liabilities of Brazil display a mild downturn in line with the declining trend in portfolio flows to EMEs, whereas those of Turkey and Indonesia continue to increase. Our decomposition analysis provides essential information about the determinant of this decoupling as well. Figure 4 indicates that for Brazil, the decline after the May 2013 tapering signal is mainly supply-led; whereas Figures 5 and 6 show that for Indonesia and Turkey, the dominant demand-pull component leads to a surge in non-core liabilities during the same era. The next section discusses the macro-prudential policies employed by these countries that could explain the difference in the data pattern in this period.

Figure 8 Portfolio Flows to EMEs and Non-Core Liabilities

(billions, indexed as 2005m1=100)



Source: EPFR, Central Bank websites. Notes: *i*) Total non-core liabilities are expressed in billions of domestic currency and are foreign exchange rate adjusted. *ii*) For Malaysia the non-core liabilities are indexed as 2007m1=100. *iii*) Portfolio flows to EMEs constitute the sum of bond and equity flows to EMEs. They are adjusted for exchange rates and prices.

Policy Discussion

As argued in the introduction, cyclical changes in global liquidity induce monetary authorities to conduct monetary policies in tandem with macroprudential policies. The countries in our sample have also undertaken countercyclical macro-prudential measures in the post-crisis period in this sense.

In Brazil, Da Silva and Harris (2012) argue that higher demand for domestic assets due to differences in yields between advanced economies and emerging markets put pressure on the domestic currency to appreciate. In addition to this positive demand shock for domestic assets, the

¹⁷ The recent global financial crisis period has shown once again that capital flows may amplify the business and financial cycles and lead to systemic risks in the recipient emerging economies. To what extent these flows may raise concerns for the incumbent economy from the stability perspective depends on their types. Capital flows differ depending on the nature of the claim (debt or equity); the denominated currency (domestic or foreign); the investor type (portfolio, foreign direct or bank) and the maturity (short or long). Typically, FDI flows and portfolio equity flows are less likely to reverse sharply and even if they do, the damage, in most cases, is much less compared to a sudden stop of bank flows. Debt type inflows, on the other hand, are mostly intermediated through the banking system and they lead to rapid domestic credit growth, which in turn poses risks to financial stability. Moreover, risks in such a case are much higher for an incumbent economy struggling with shrinking GDP, price deflation and increasing default risks. This relatively higher volatility of bank-related flows helps us to rationalize our choice of non-core liabilities of the aggregate banking sector, among other indicators of financial risk.

global rise in commodity prices was another factor behind inflationary pressures. As a response to these risks of overheating, Brazil applied several macroprudential policies, including different reserve requirements for banks with short foreign exchange positions or capital requirements for certain market segments. However, Carvalho and Castro (2015 pg.5) argue that the strong synchronization between monetary and macroprudential policies in the post-crisis period weakened in recent years with the former having a strong anti-inflationary, contractionary stance while macroprudential pillar were mainly conducted for smoothing the credit conditions in *only specific segments*. This argument might be in line with our result for Brazil for the last two years as shown by the buoyant demand conditions (positive light bars) together with a decline in the global supply component (negative dark bars). Anti-inflationary monetary policies targeted the former buoyant demand component vanishing the need for macroprudential policy against the negative impacts of the foreign flows.

Note that, the abovementioned argument does not indicate a clear-cut distinction between the macroprudential tools and monetary policy, such as the former targeting capital flows and the latter focusing on the domestic economy. On the contrary, many central banks use the term *policy-mix* to motivate the simultaneous use of both policies for multiple purposes. The use of macroprudential tools against the negative impacts of intense capital flows often go hand in hand with appropriate monetary policy. For example, Bank Indonesia rationalizes the increase in interest rates, right after the tapering signal, in June 2013 with a “*policy mix to respond pre-emptively to rising inflation expectations and to maintain macroeconomic stability and financial system stability amid increasing uncertainty in global financial markets... In addition, macroprudential policies are being prepared to prevent excessive risks in certain sectors.*” (BOI, 2013). This is also in line with the demand pressure (positive light bars) starting in 2013 that continues for one and a half year. Indonesian authorities also implemented macroprudential policies including reserve requirements based on loans to deposit ratios and the introduction of loan-to-value ratios to curb excessive lending in housing and automotive loans (BOI, 2015)¹⁸.

Similarly, Turkish monetary authority altered the required reserve ratios for foreign exchange denominated liabilities in order to encourage the banks to extend the maturity of their non-core liabilities. The required reserve ratios of financial institutions whose core liability ratios are higher than the sector average are remunerated at higher rates in this period (CBRT, 2014, 2015 pg. 13-14). Yılmaz and Süslü (2016) show that the sensitivity of the non-core liabilities of the Turkish banking system increased after the global financial crisis¹⁹.

Regarding the macroprudential policies including non-core liabilities, we should also mention Korea. While it is not included in our analysis, The Korean central bank also imposed a Macro-Prudential Stability Levy on non-deposit foreign currency liabilities after the global financial crisis (FSC, 2011). This levy is suggested as an *automatic stabilizer* that would dampen the procyclical movements of foreign borrowings over the cycle. Bruno and Shin (2013) argue that these macroprudential policies lowered the vulnerability of the Korean economy to the excessive movements in global liquidity. In a similar manner, the IMF (2010) also recommends the use of balance sheet indicators to measure the systemic risk in the financial sector. They also suggest macroprudential policies such as a levy on wholesale funding, short-term debt or foreign flows would be effective to dampen these risks. Corroborating with this, Cuadra and Nuguer (2018)

¹⁸ Indonesia was also a recipient of capital flows in the recent years. As a report by BOI (2012) documents, the higher reliance on short-term funding by domestic banks would increase the liquidity risk for the intermediaries.

¹⁹ Also, see Kazaz (2020) for an analysis of Turkish non-core liabilities in recent periods.

suggest that if the credit growth is faster than that of bank deposits in emerging markets, a levy on non-core liabilities would smooth the transmission of financial shocks from advanced economies.

The property and retail lending sectors were at the focus of the macroprudential policies in Malaysia, factors such as the imposition of a real property gains tax or loan-to-value limit on housing loans (BIS, 2015, pg. 239). The same BIS study argues that in Malaysia the domestic banks became less reliant on interbank and wholesale funding after the Asian financial crisis of 1997. However, the surge in external borrowing of non-financial corporations points to potential problems in the stability of banks' funding sources. This indirect impact is also important because, while the deposits by nonfinancial corporations seem more reliable than that of financial institutions, they are still riskier than that of household deposits. This instability intensifies when the firms act as surrogate financial intermediaries. Shin (2013) gives the example of China where banks cannot borrow from international markets, yet firms can obtain foreign loans and deposit these proceedings into the domestic banking system as collateral. Hence, the open position of the corporate sector could trigger a system-wide shock in case and deserves close monitoring. Chung et al. (2015) shows that in countries where the capital inflow takes place through non-financial corporates, the liabilities of the banking sector to the non-bank firms increase. Hence, these claims should also be monitored as a part of the systemic risk indicator for these countries.

Conclusion

The high level of international financial integration between economies all across the world generates significant risks both within and across national borders. Capital flows, in that sense, act as a transmission channel of risks across borders and thus may lead to the build-up of financial sector imbalances. The bulk of these capital flows are intermediated through cross-border banking channels. However, cross border bank lending constitutes the most procyclical component of the cross-border flows and has a potential to reverse abruptly when the financial cycle turns. In that regard, the procyclical patterns of cross-border banking sector liabilities to global banks may potentially serve as an indicator of the phase of the financial cycle. From this standpoint, non-core liabilities of the aggregate banking sector serve as a proxy to measure systemic risk.

In this paper, we argue that decomposing the non-core liabilities of the banking sector into their demand and supply components would be useful to differentiate the global liquidity impact from the domestic conditions. Through the instances of four emerging economies, Brazil, Indonesia, Turkey and Malaysia, we have argued that, during and after the global financial crisis, countries have exhibited similar patterns in terms of the movements in their non-core liabilities as well as their supply and demand components. Though, we have noted that the heterogeneity in terms of the prevailing domestic economic stances of countries might result in use of alternative countercyclical macroprudential policies in tandem with monetary policies. In this respect, we can see that differentiating the demand and supply components of the non-core liabilities of the banking sector is crucial from an overall macroeconomics policy perspective, as it provides valuable information regarding the appropriate design of countercyclical macroprudential policies.

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Appendix

Noncore Liabilities Data

Country	Noncore Definition (all items below are collected from the liabilities side of the aggregate balance sheet of the banking sector for each country)	Data Source	Data Range
Brazil	Liabilities to Nonresidents	Banco de Brazil	May 2006 -June 2015
Indonesia	Liabilities to Nonresidents + Liabilities to Other Financial Corporations	Bank Indonesia	April 2004-June 2015
Malaysia	Amount Due to Designated Financial Institutions (Commerical Banks, Islamic Banks, Investment Banks and Other Banking Institutions) +Bills and Acceptances Payable+ Liabilities to Non-residents	Bank Negara Malaysia	May 2008-June 2015
Turkey	Payables to banks + Repo transactions [See Akdoğan and Yıldırım (2014) for a detailed definition]	Central Bank of the Republic of Turkey	May 2006-May 2015