

## Summary essay

based on the article "Does Macro-pru leak? Evidence from a UK policy experiment",  
by Aiyar, Calomiris and Wieladek (2013)

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The paper (Aiyar et al. 2013) analyses the problem of macro-prudential regulation effectiveness in controlling aggregate credit supply, when there are unregulated sources of credit substitution available in the economy. The paper uses a unique dataset from the UK as micro evidence to show that, in the sample, an increase in bank-specific time-varying capital requirements 1. Reduces lending by regulated banks, and 2. Increases lending by unregulated banks. The leakage of the macro-prudential regulation caused by unregulated banks (i.e. affiliated and unaffiliated foreign branches) is then estimated using the results of econometric estimation and is shown to be about one-third of the total effect on the aggregate credit growth from the regulatory change.

This summary essay will proceed as follows:

1. Theoretical settings of the paper
2. UK approach to bank regulation and unique features of the dataset
3. Empirical estimation of the leakages
4. Conclusion, implications and remarks

## 1. Theoretical settings of the paper

Control over aggregate credit growth in the economy is one important channel of macro-prudential regulation which is aimed, first and foremost, at limiting systemic risk and maintaining financial resilience. Time-varying minimum capital requirements imposed on banks' assets can be used as a tool to smooth credit cycle by affecting lending supply of banks. In other words, during expansion the regulator is supposed to increase minimum capital requirements to rein in aggregate credit supply to avoid overheating and bubbles, whereas during recession relaxing prudential regulation is supposed to stimulate lending and encourage investment.

Therefore, in this respect, macro-prudential regulation could be regarded as effective when it can control aggregate credit supply in the economy. The authors have identified three necessary conditions for this to work:

1. Equity finance must be more expensive than debt finance. A bank can either increase capital or decrease loans to satisfy an increase in minimum capital requirements. If equity finance is cheap, a bank will raise capital instead of decreasing loans.
2. Minimum capital requirements must bind. A change in minimum capital requirements must cause banks to adjust their lending behaviour instead of simply shrinking the buffer and keeping on lending at the previous rate.

The authors have proved empirically that in their sample the first two conditions are satisfied, i.e. regulatory capital requirements were binding on the behaviour of the sample of UK banks during the period 1998-2007. However, in order to control the aggregate lending supply in the whole economy, the third condition must be met:

3. Limited substitutability of alternative funding. This is the possibility of the so-called leakage, and is the focus of the paper. When loans from regulated banks are reduced, there may be other substitutable funding from entities that are not regulated by the increased minimum capital requirements. These entities may take advantage of the situation by increasing their loans to the same market that the regulated banks are retreating from, this is what the paper called "stepping into the gap" in the market. This threatens the effectiveness of the regulation because the increase in loans from unregulated entities offsets the initial effect that an increase in capital requirements was supposed to achieve—reduction of the aggregate credit supply in the economy.

## 2. UK approach to bank capital regulation and unique features of the dataset

There are two types of banks considered in this paper: banks that are regulated by the Financial Services Authority (FSA)—the UK regulator. This includes UK-owned banks and foreign subsidiaries. Another type is foreign branches which are unregulated by the FSA. The

panel micro-data contains both types of banks and their quarterly minimum capital requirements, lending, and other attributes of interest, from 1998 to 2007.

This dataset is unique due to two features of the UK capital regulation at that time:

1. The FSA follows a discretionary regulatory policy, which sets bank-specific, time-varying capital requirements, called the trigger ratio, above the universal 8% minimum capital requirements from Basel I. This allows the paper to isolate the bank-specific effect of a change in capital requirements on the banks' lending supply.
2. The setting of trigger ratio does not consider credit risks<sup>1</sup>. Rather, it considers risks from bank-specific characteristics and management practices, such as the concentration of loans towards a particular sector, the culture and quality of corporate governance, etc. This ensures the exogeneity of the trigger ratio to lending supply, and allows for a causal interpretation of changes in capital requirements on credit supply.

Although the setting of trigger ratios is micro-prudential in nature, the paper has shown that the averages of the trigger ratio changes in the sample period are strikingly counter-cyclical—evidence that the outcomes of FSA decision were macro-prudential in nature.

### 3. Empirical estimation

In order to calculate the size of the leakage the paper estimated the impact of capital requirements changes on credit supply of UK-regulated banks and lending growth of unregulated foreign branches.

Bank-specific variation in capital requirements makes it possible to use panel data on individual banks to gauge the effect of capital requirements changes on credit supply and to estimate the credit substitution effect via foreign branches. Standard panel fixed-effects framework was used.

Importantly, when regressing lending growth on changes in capital requirements, the authors also controlled for loan demand. Only few pre-existing studies of lending have tried to separate the supply side from the demand side.

Estimation of the regression of lending growth of regulated banks on changes in capital requirements (more precisely, on the contemporaneous value and several lags of the variable) yielded strong and persistent negative effect – a 1% increase in capital requirements induced, on average, a cumulative fall in the lending supply of affected banks in the range of 5.7% and 7.3%.

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<sup>1</sup> UK regulators assumed that such risk was already covered by the 8% minimum capital requirement, and requirements in excess of that should reflect other types of risks that were not covered by Basel I – i.e. environmental risks; customer, product and market risks; business process risks; prudential risks; management, governance and culture and excess capital and liquidity (Aiyar et al, 2014).

As a second step the authors estimated the effect of loan supply changes of regulated banks on lending growth of unregulated banks (loan supply of regulated banks was instrumented using changes in capital requirements). Again, they found a strong and persistent negative effect of changes in loan supply by the reference group of regulated banks on lending by foreign branches – the average effect was about 3%.

Having the aforementioned estimation results the authors computed rough estimate of the leakage itself – about 33%. Hence, the lending growth of foreign branches offsets about one-third of the total aggregate credit impact of variation in regulatory capital requirements. So, leakages are qualitatively and quantitatively important. Moreover, the authors implemented a battery of different robustness checks and it is very unlikely that any kind of endogeneity bias could be present.

#### 4. Conclusion, implications and remarks

Clearly, this considerable leakage presents a serious problem for the regulator – basically, empirical evidence provided in the paper shows, to which extent globally acting banking groups can impede macro-prudential regulation in one country.

Then, the question is - what can be done so as to minimize or eliminate these leakages? The authors argue that it is necessary to enhance international cooperation among financial regulators. The paper strongly supports the principle of international reciprocity enshrined in Basel III accord and the European CRD IV directive. Moreover, the authors argue that 2.5% cyclical variation in minimum capital requirements for banks is actually not enough. They claim that at the time that policy was announced, there had been no microeconomic studies of the effects of capital requirement changes on the supply of credit<sup>2</sup>.

However, looking at the empirical evidence provided in the study it would be reasonable to ask whether this final thesis is not too strong. First and foremost, estimated credit substitution effect should be interpreted very cautiously – it doesn't tell us much about loan-supply responses in other countries as well as in the future in the UK. Acquired size of the leakage is relevant basically only for the UK and only during sample period 1998-2007. Furthermore, loan-supply responsiveness estimated in this study provides short run effects of tightening capital requirements whereas it doesn't tell us much about long run loan supply elasticities. Next, in the sample period only very small changes in capital requirements are present (few of them exceed 1.5%). Hence, the empirical evidence of this study doesn't provide any information about loan supply responsiveness to large changes in capital requirements. Last but not least, banks with

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<sup>2</sup> Aiyar, Shekhar & Calomiris, Charles & Wieladek, Tomasz, 2014. "Identifying channels of credit substitution when bank capital requirements are varied," Bank of England working papers 485, Bank of England.

very low levels of capital are also not present in the analysed sample period, however, for these banks the effect could even have the opposite sign – hence, the data used in the paper doesn't allow to analyze possible reversal of loan supply responsiveness at very low levels of capital using empirical evidence from the sample period<sup>3</sup>.

Next, the estimated size of the leakage is likely to represent just a lower bound on the whole size of the regulatory leakage. The point is that with a high level of probability there could be several other substitution channels – apart from that via foreign branches analyzed in the paper. Credit substitution can occur also outside banking system (for example, through capital markets) and through cross-border lending.

It depends very much on particular economic and financial conditions that we are analysing; to put it another way, there is state-dependency of the credit substitution effect. In particular, different channels are likely to dominate during "normal" times (when there is no systemic crisis that hits the whole financial system) and during crisis periods. The point is that during a crisis there is a massive disruption in common funding markets and, as a result, substitution channel via foreign branches becomes basically inaccessible. For example, in the paper by Adrian, Colla and Shin from (2011) it is shown that in the US during the recent financial crisis there was considerable substitution of bond finance for bank loans<sup>4</sup>. Furthermore, apparently also in the UK during the recent financial crisis there was a significant increase in bond issuance.

In addition, in the paper being discussed the authors do not show the exact mechanism on how the leakage within the identified channel (i.e. via foreign branches) occurs. However, there are two sub-channels – the leakage can occur via affiliated and via unaffiliated branches (affiliated branches are those who share a common parent institution with a subsidiary operating in the UK). Due to the fact that foreign banking groups can own both a branch and a subsidiary they can easily shift risky portfolios from their subsidiary to their branch when the former faces tightening regulatory conditions. However, the credit substitution can also occur as a result of real interbank competition when unaffiliated foreign branches compete with UK-regulated banking entities operating in the same sector of the economy.

It is important for policy-makers to know which of these two sub-channels is dominating because it determines the best way to minimize/eliminate the identified leakage. In their later

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<sup>3</sup> Aiyar, Shekhar & Calomiris, Charles W & Wieladek, Tomasz, 2014. "A primer on bank capital regulation: Theory, Empirics and Policy", p.17-18

<sup>4</sup> Adrian, T, Colla, P and Shin, HS (2011). "Which Financial Frictions? Parsing the Evidence from the Financial Crisis," Federal Reserve Bank of New York Staff Report No. 528.

study published earlier this year the authors tried to answer exactly this question – they estimated empirically the relative strength of different credit substitution channels and, in particular, the relative strength of the aforementioned two sub-channels of the leakage via foreign branches<sup>5</sup>. Their finding was that the credit-supply responsiveness of affiliated branches was two times larger than the responsiveness of unaffiliated branches. In addition, in this later study the overall size of the leakage turned out to be larger than in the previous paper – 43.1% instead of 33% before (the authors believe that the later estimate should be more precise).

To sum up, the authors identified and showed empirically an important phenomenon – credit substitution effect via foreign branches induced by tightening regulatory conditions in the domestic country. However, the acquired estimate cannot be considered by policy-makers when elaborating new macro-prudential regimes. Generally, the nature, size and the exact mechanism of such leakages remain uncertain – first and foremost, due to the lack of empirical evidence. The main contribution of this paper is that it provided this highly valuable empirical evidence on the effectiveness of macro-prudential regulation. Unique microeconomic data on UK bank regulation enabled the authors to estimate the effects of variation in regulatory capital requirements on the aggregate credit supply.

Since the outcome of the FSA decisions was macro-prudential in nature, UK microdata indeed provides a very good ground for testing the efficacy of macro-prudential regulation – however, as already mentioned before, the external validity of such testing remains highly limited.

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<sup>5</sup> Aiyar, Shekhar & Calomiris, Charles & Wieladek, Tomasz, 2014. "Identifying channels of credit substitution when bank capital requirements are varied," Bank of England working papers 485, Bank of England.

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