The International Transmission of Bank Minimum Capital Requirements: Empirical Evidence from the UK

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Bank minimum capital requirements have long been used as a tool of micro-prudential regulation (to ensure the safety and soundness of individual banks). After the global banking crisis of 2007-2009, capital requirements will be set in new ways, not only to better achieve micro-prudential goals, but to target new macro-prudential objectives. The primary objective of macro-prudential regulation is to smooth aggregate bank credit supply over the business cycle. Basel III incorporates a so-called "counter-cyclical capital buffer", in which minimum capital requirements are to be adjusted for precisely this purpose.

Our prior research has used the unique capital requirement regime of the UK during the period 1998-2007 to investigate the extent to which changes in minimum capital ratio requirements are effective tools for controlling the supply of lending of regulated banks, and the extent to which alternative sources of lending that are not under UK regulatory control act to offset the aggregate effect of changes in loan supply that are produced by changes in capital requirements. In Aiyar, Calomiris and Wieladek (2012a) we find that capital requirements are a powerful tool for controlling loan supply at regulated banks, and that foreign branches operating in the UK that are not subject to UK capital regulation offset a large proportion (30 percent) of the aggregate effects on loan supply of capital requirement changes. In subsequent work (Aiyar, Calomiris and Wieladek (2012b), we find that capital

requirements are a far more powerful tool than monetary policy for affecting bank loan supply. Large banks react to a monetary policy contraction (a reduction in the supply of depository funding) by raising debt from other sources, rendering monetary policy largely ineffective as a means of controlling the supply of lending. In a third paper (Aiyar, Calomiris and Wieladek 2012c), we find that how banks react to capital requirements depends on their international organizational structure. Large global banks operate an internal capital market that links their affiliated subsidiaries and branches, allowing them to react to changes in UK capital requirements by shifting assets from banks under UK regulatory control to foreign branches that are not subject to UK capital regulation.

Here we propose to undertake a fourth paper, which will focus on the consequences of capital requirement changes in one country for the lending of banks in other countries. There is a growing literature on the effects of shocks to banks in one country on bank lending elsewhere (see, for example Peek and Rosengren 1997, Cetorelli and Goldberg 2008, 2011, Aiyar 2011, and Schnabl 2012). More generally, Niepmann (2011) shows that cross border bank lending is driven by factor endowments, while the domestic intermediation of locally sourced funds by foreign banks is due to a difference in the efficiency of intermediation. This research implies that changes in the domestic capital requirement regulation of internationally active banks is likely to disturb the allocation of credit to non-financial firms across borders. The associated social costs, such as shifts in the relative availability of funding across countries for individuals and non-financial corporations abroad, could be substantial.

The empirical results from our proposed study could have important policy implications. For example, large effects of capital regulation changes on relative credit

supply might encourage efforts already underway to coordinate macro-prudential regulation across countries. Despite the potentially important spillover effects on lending and their consequences for policy no previous work has investigated this issue empirically, a gap in the literature that we aim to fill in the proposed paper.

Our study will examine the international transmission of minimum capital requirements using a unique UK dataset, which permits us to trace the effects on cross-border credit supply of shocks to capital requirements originating in the UK. Building on our previous work, we exploit a policy experiment in the UK from 1998Q3 to 2007Q2. During this time, the Financial Services Authority (FSA) set time-varying minimum capital requirements—so-called ”trigger ratios”—at the level of individual banks. Variation across banks and over time in minimum capital requirement ratios was substantial and, when averaged across all banks, appeared to be pro-cyclical, as envisaged by Basel III.[1]

We aim to estimate the following benchmark equation, with lending by FSA-regulated bank *i* to country *j* as the dependent variable:

$$\Delta l_{ijt} = \sum_{k=0}^{K} \beta_{t-k} \Delta KR_{it-k} + \delta CORE_{ijt} + \sum_{k=0}^{K} \gamma_{t-k} \Delta KR_{it-k} CORE_{ijt} + \Lambda X_{jt} + e_{ijt}$$

[1] This institutional setup allowed us to establish that (i) FSA-regulated banks—i.e. UK-owned banks and the resident subsidiaries of foreign banks—reduced credit supply substantially in response to an increase in the minimum capital requirement, and (ii) foreign branches—which were not subject to FSA capital regulation—expanded lending in response to the regulatory change, partially offsetting the credit supply contraction by regulated banks.

where Δl_{ijt} is the growth rate of lending by banking group *i* to country *j*. This comprises both cross-border lending by the UK-incorporated entity, and lending by the local affiliate (if any) of banking group *i*. ΔKR_{it} is the change in bank i's minimum capital requirement (in percent of risk-weighted assets) in quarter t.[2] Several lags of this term are included to allow lending to adjust gradually to changes in the regulatory ratio. $CORE_{ijt} = \frac{l_{ijt-1}}{\sum_j l_{ijt-1}}$ is the weight of country *j* within banking group *i's* portfolio. X_{jt} is a matrix of country-specific time fixed effects to account for demand shocks in each country. Finally, $\Delta KR_{it} CORE_{ijt}$ is an interaction term between CORE and minimum capital requirements.

This sample design has several noteworthy features. First, X_{jt}, the country-specific time fixed effect is a way of asking whether the *same* country in the *same* time period borrowing from two different UK-affiliated banks experiences a larger decline in lending from the bank facing a relatively greater increase in minimum capital requirements. This term is therefore the direct analogue of the firm-specific fixed effect methodology pioneered by Khwaja and Mian (2008) to absorb changes in demand conditions. Since the comparison is across banks for the *same* country in a *given* time period, all demand shocks in country *j* at time *t* should be absorbed by this term.

Second, *CORE* is a measure of how important lending activities in country *j* are for bank *i*, that is, to what extent the country is part of bank *i*'s "core" business. It may be that the liquidity shock imposed by a capital requirement does not lead to a proportionate reduction in the bank's lending activities in all countries, but that lending in non-core

[2] To be precise, this is the change in the minimum capital requirement of the UK-incorporated entity within banking group *i*.

countries is pared back first. This would be consistent with some empirical evidence that banks scale back non-core lending disproportionately in response to liquidity shocks (Aiyar (2011), de Haas and Lelyveld (2010)). Our prior is therefore that the interaction term will be positive (that is, lending growth will fall by *less* in a core country relative to a non-core country, when the minimum capital requirement on bank *i* is raised).

Third, the specification above is quite general, and can be adapted to examine related issues or different samples. For example, we plan to study bank-specific characteristics that might influence the transmission mechanism, such as liquidity constraints or differential reliance on wholesale funding. We shall also consider different samples. The largest possible sample is that of all FSA-regulated banks, but this could be sub-divided into UK-owned banks and resident foreign subsidiaries, to see whether the two groups transmit regulatory changes internationally in different ways. With foreign subsidiaries it would also be interesting to ascertain whether they exhibit "home bias", e.g. contracting lending in their home country by proportionately less than in some similar country *j*, in response to an increase in UK minimum capital requirements.

Finally, we can also investigate if the degree of spillover changes by asset class. In particular, come assets are considered riskier than others. So one would expect a different impact on the affected banks cross-border holding of shares than loans, and the impact on lending to bank and the non-bank private sector should be different as well. Our extensive dataset will allow us to test all of these hypotheses individually.

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