

## Sharon Donnery: When is the right time? Macroprudential policy and the cycle

Remarks by Ms Sharon Donnery, Deputy Governor of the Central Bank of Ireland, at Maynooth University, National University of Ireland, Maynooth, 31 May 2018.

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It is a great pleasure to be with you today, and I would like to thank Dr. Rousseau and the staff at Maynooth University for arranging the talk and following panel.

I briefly lectured in economics here before I joined the Central Bank of Ireland so it is a particular personal pleasure to return to deliver a speech here today.<sup>1</sup>

In my remarks I would like to take stock of the current state of the macro-financial environment in Ireland, the uncertainty around the outlook, and the implications for policy, in particular macroprudential policy.

### Where we are

The Irish economy and financial system have been through a remarkable decade.

Following the onset of the financial crisis, and the painful adjustment that households, businesses, and the public finances went through at that time, the cycle has now firmly turned. Consecutive years of strong employment growth have brought the unemployment rate down to its current level of about 6 per cent. Household incomes have benefitted from the improved labour market, supporting higher levels of consumption and investment, and promoting an improved trading environment for domestically focussed businesses. The Government finances have also benefitted from the improved economic performance, with the general government deficit now being close to zero.<sup>2</sup>

Importantly, this recovery has been sustained in recent years by a favourable global backdrop – a period of robust economic growth in our main trading partners, accommodative monetary policy and relatively benign financial market conditions.

These strong cyclical dynamics in the economy are expected to be increasingly reflected in wage growth.<sup>3</sup> However, they have already been evident in asset prices, and in particular, the growth in house prices in recent years. This is due to the current relatively low levels of housing supply, with the sector only slowly recovering from the crisis, while broader positive drivers of housing demand in terms of demographics, incomes and interest rates, have continued to strengthen.

These cyclical dynamics are also reflected in the performance of the domestic banking sector. Profits have benefitted in recent years from the improved economic situation. Funding costs have come down in the context of the low interest rate environment. Non-performing loans (NPLs) have also fallen, albeit they still require concerted efforts to bring them down to appropriate levels. New lending activity for households and businesses continues to increase substantially. In 2017, owner-occupier mortgage lending increased by almost 30 per cent.<sup>4</sup> Gross new lending to SMEs rose by 10 per cent.<sup>5</sup> As is common following banking crises, new lending growth was for an extended period offset by repayments, as the household and business sectors deleveraged. However, growth in the stock of non-financial private-sector credit, which initially emerged in loans to larger enterprises, consumer credit and primary dwelling home mortgages, is becoming increasingly broad based.

Despite these very positive developments in recent years, certain challenges remain as a legacy of the last crisis. The extent of long-term mortgage arrears and the relatively high levels of private and public debt are cases in point. At this stage of the economic and financial cycle, however, we are now facing additional challenges – how to maintain sustainable and balanced growth when the economy hits capacity constraints.

### **What is the outlook?**

We continue to see strong cyclical growth with a tighter labour market and constraints on housing and other infrastructure. While well-known measurement issues means there is some uncertainty as to the exact stage of the economic or financial cycle in Ireland, the relatively low unemployment rate, the continuing rise in real estate prices and the turn in the credit cycle are indicative of potential emerging cyclical risks. We also know from the experience of the mid-2000s that strong cyclical growth can lend itself to imbalances. These imbalances make households, businesses and banks more vulnerable to negative shocks. The vulnerabilities that remain from the last crisis compound the sensitivity of the financial system to any such change in conditions. For example household debt stood at €140.5bn in Q4 2017. Irish household's Debt-to-Income ratio stood at 136.9 per cent in Q4 2017, which is extremely high compared to our peers.<sup>6</sup> Such legacy debts increase our vulnerability to future cyclical reversals. While we remain a long distance away from the worst of the excesses in 2004-2007 – where growth was more dependent on construction activity and credit was fuelling a real estate bubble – it is important for us as policymakers to recognise the risks related to the stage of the economic and financial cycle. If necessary, we should also be willing to take actions to offset those risks.

In an Irish context, we must also consider another dimension, being as we are the typical 'small open economy'. Even when economic activity, asset prices and credit growth are consistent with structural or fundamental conditions, the external environment underpinning those conditions is outside of our control. The responsiveness of the Irish macro-financial environment to external developments is also typically higher than other European countries. We do not have to look far for the evidence of this. Over the past twenty-five years or so growth in employment, incomes, consumption, domestic investment, real estate prices and credit have been more volatile in Ireland than in the euro area, the United Kingdom, Sweden or Denmark.<sup>7</sup> While the experience of the most recent quarter century will not necessarily hold going forward, it would be remiss of us to ignore these past realities.

During the recovery phase, this responsiveness to external conditions was a strength – it is after all partly responsible for how well the economy has recovered since the crisis.

However, it is also a source of vulnerability.

If recovery can be so significant with benign external conditions, the impact of negative external conditions can also be as significant.

I have already mentioned the main external factors that contributed to Ireland's recovery since the crisis. To recall, these include trading partner growth, low interest rates and substantial global liquidity lending themselves to benign financing conditions. Not only are these outside of the control of domestic policy makers, their path over the short-to-medium term is uncertain.

The uncertainty around the Brexit process poses the most significant issue for Ireland in this regard. Given the degree of direct and indirect exposure of Irish financial and non-financial firms to the UK economy, Brexit in any form is negative for the Irish economy and financial system. However, a disruptive hard Brexit would present significant and pervasive challenges. There is also a more general tendency toward protectionism, particularly in the United States, which if it materialises to a greater extent, could reduce global demand for Irish goods and services. At the

same time, there is an increased role of international investors and market-based finance generally in Irish real estate. This makes developments in the market potentially more vulnerable to global financing and liquidity conditions, while at the same time providing a beneficial diversification of funding sources.<sup>8</sup>

### **What can domestic policymakers do?**

So what role is there for domestic policy, faced as it is with emerging cyclical risks and substantially uncertain external conditions? Events beyond our control or influence will continue to shape developments in the domestic macro-financial environment. So what can we do to steer the domestic responsiveness to those events, and limit the excesses of the economic and financial cycle? In a small open market economy, such a goal may not be fully achievable. However, can we build such resilience in the face of uncertainty and what do I mean by resilience in this context?

Building resilience means using the gains from strong positive cyclical dynamics to build up sufficient buffers to withstand the losses that will arise during a downturn. These buffers can then be released when necessary. Resilience can also complement efforts of policy to dampen, or at least not to amplify, the cycle.

Building such resilience is an important motivating factor across a number of domestic policy areas. In fiscal policy, for example, the Government has acknowledged that a priority is to build fiscal buffers to withstand adverse developments. It has also noted that the appropriate Government debt target in the Irish context is significantly below the European Union's Stability and Growth Pact threshold of 60 per cent of GDP, not just because of the measurement issues around GDP, but also due to the relative vulnerability of the public finances to negative shocks.<sup>9</sup>

In the area of macroprudential policy, for which the Central Bank has responsibility, we have also cited resilience as a key motivating factor to act. To recall, the objective of macro-prudential policy is to mitigate the risk of a disruption to the provision of financial services, caused by an impairment of all or parts of the financial system, with serious negative consequences for the real economy. This risk is known as systemic risk.

Our macroprudential framework and toolkit builds resilience in the system against different risk factors, and complements the firm-specific resilience that is the focus of micro-prudential regulation.

To build in *structural* resilience, the Other Systemically Important Institutions (O-SII) buffer is designed to reduce the potential impact of a systemically important financial institution's failure on the domestic economy.<sup>10</sup>

Looking at *sectoral* resilience, capital requirements can be applied by increasing micro-prudential capital requirements for exposures to a particular sector or asset class. Alternatively, this can be achieved by raising the risk weights associated with a particular sector or asset class. The systemic risk buffer also aims to address systemic risks of a long-term, non-cyclical nature that are not covered by the Capital Requirements Regulation.<sup>11</sup> This buffer has been applied for various types of exposures in ten EU countries, but is not yet transposed into Irish law.

Finally, one of the main objectives of the mortgage measures, which limit the extent of high loan-to-value (LTV) and loan-to-income (LTI) mortgages, is to ensure banks and borrowers build resilience so as they are more able to withstand the impact of negative shocks. We have committed to an annual review of these measures to ensure they continue to achieve their objectives effectively.

The two reviews that have taken place since the introduction of the measures have shown that they have been successful in mitigating the extent of excessively high LTV and LTI lending, and will continue to contribute over time to minimising both the probability of default and the loss-given-default that may arise in the presence of negative shocks.

However, given the stage of the economic and financial cycle and the uncertainty surrounding the outlook for the macro-financial environment, it is timely for us to consider wider aspects of the macroprudential policy toolkit, so we can most effectively promote resilience in the financial system. In particular, it is appropriate to consider capital-based instruments that can complement the mortgage measures in achieving the overall objective of macroprudential policy, and mitigate the impact of cyclical systemic risk. One such instrument available to the Central Bank, and which has been activated in a number of countries already, is the Countercyclical Capital Buffer (CCyB).

### **Why capital based measures?**

The CCyB is a time varying capital requirement designed to make the banking system more resilient and less pro-cyclical. It formed part of the range of measures introduced in the aftermath of the financial crisis, and has been operational in Ireland and across Europe since 2016. The Central Bank is the authority in Ireland that sets the CCyB rate.<sup>12</sup> It is calculated as a proportion of core equity tier 1 (CET1) capital that must be held relative to the amount of risk-weighted Irish exposures a bank has on its balance sheet. We review the buffer rate on a quarterly basis, and it is currently set at 0 per cent for Irish exposures.

From its original conceptual design through to its practical application in a number of countries, the primary aim of the CCyB relates to protecting the banking sector from the build-up of cyclical systemic risk. That is to ensure the sector overall holds sufficient capital to help it maintain the flow of credit to the economy during periods of financial stress.<sup>13</sup>

This buffer works by increasing the minimum capital requirement of banks when cyclical risks begin to build. In this way, banks should have a greater level of capital to absorb losses that may arise in any subsequent downturn or period of financial stress. During such a period the buffer can then be released, reducing minimum capital requirements in a sustainable way from a system-wide perspective. As a result, the potential dampening impact of capital requirements on bank lending is reduced during a downturn. This could otherwise restrict the flow of credit, further depressing economic activity in a pro-cyclical manner.

The use of a CCyB could potentially also limit the build-up of risk itself, to 'lean against the wind' so to speak. However, at best this can only be viewed as a positive side effect rather than the goal of the buffer itself. In general, measures that target specific sources of systemic risk are more effective at curbing the cycle. The mortgage measures in Ireland would be an example of the latter, and there are important complementarities between the use of policies such as the mortgage measures and the CCyB, which I will return to in a moment.<sup>14</sup>

Before I do, I would briefly like to consider the experience of some other countries that have introduced a positive CCyB rate, the motivations of authorities in doing so, and what, if any lessons we can learn from these for Ireland.

In the UK, the primary objective of the Bank of England's Financial Policy Committee (FPC) in setting the CCyB is to ensure that the banking system is able to withstand stress without restricting essential services, such as the supply of credit, to the real economy.<sup>15</sup> The FPC have set out their stance that the CCyB will be set in the region of 1 per cent before the level of risk becomes elevated. By moving early during periods of moderate risk and before risks are elevated, the FPC expects to be able to vary the CCyB gradually. The UK CCyB will be 1 per

cent by end-November 2018.

In Lithuania, the central bank have set out the main purpose of the CCyB as holding a sufficient capital buffer to cover potential bank losses in case of cyclical systemic risk or during an economic downturn.<sup>16</sup> They have outlined that if economic growth and credit growth are sustainable and no cyclical imbalances form in the economy, their intention is to set a CCyB of at least 1 per cent. When signs of overheating of the economy, unsustainable trends in the credit or real estate market or signs of other cyclical imbalances are observed, the CCyB rate would be further increased to above 1 per cent. The CCyB is thus accumulated more slowly and more consistently, while the accumulated buffer would also help mitigate unexpected smaller fluctuations in the financial cycle that could arise from economic or other unexpected shocks. The Lithuanian CCyB will be 0.5 per cent by the end of the year.

In Sweden, the purpose of the countercyclical capital buffer is to maintain banks' resilience, ensuring that the banking system as a whole has sufficient capital to sustain the flow of credit to households and corporations following shocks to the financial system that could cause a credit crunch. The buffer rate was initially set at 1 per cent with effect from September 2015, and has since been raised to 2 per cent. A key motivating factor for the Swedish financial regulator in setting a positive CCyB rate for the first time was the high level of household indebtedness, even though growth in credit was not particularly excessive.<sup>17</sup>

I believe certain features of the frameworks in these three countries have relevance for us in Ireland:

- ♦ The central motivation of resilience;
- ♦ The consideration of broad cyclical risks;
- ♦ The preference to move early in the cycle so as to ensure sufficient resilience is built-up; and
- ♦ The interplay between existing vulnerabilities, such as high debt levels, and emerging vulnerabilities related to cyclical dynamics.

Given these relevant features, and what we know about the short-to-medium term outlook for the Irish macro-financial environment – or perhaps more importantly what we are unsure of – a more active use of the CCyB in Ireland should be considered.

### **Why now?**

With these factors of resilience, the emergence of broad cyclical risks, and their interaction with existing vulnerabilities in mind, what are the potential benefits and costs of having a positive CCyB rate early in the cycle?

The key medium-term benefit is more stable growth without a pro-cyclical reaction of bank lending to future downturns.<sup>18</sup> With the focus on resilience, the real countercyclical benefit of the CCyB is in a downturn. In order to mitigate that pro-cyclical reaction by banks however, the buffer has to be built up sufficiently in advance.

Scenario analysis by Central Bank of Ireland staff has shown that an increase in minimum capital requirements earlier in the cycle maximises bank resilience more so than moving later in the cycle. Their work suggests that this is without the adverse impact of limiting economic activity.<sup>19</sup> These findings in the Irish case are also consistent with the perspective of the framework in the UK, which references how an early and gradual build-up of the buffer can minimise any potential tightening of credit conditions.

Another important benefit of moving early relates to data and implementation lags. A number of

relevant indicators for setting the CCyB are only available with a lag, for example National Accounts data. With respect to implementation, any increase in the rate only becomes effective 12 months after it is announced. This allows time for banks to adjust where necessary to the higher capital requirement.<sup>20</sup> These data and implementation lags lend themselves to activation of the CCyB relatively early in the cycle. This is especially important for a macro-financial environment typically more volatile and subject to uncertainty as in Ireland.

I referred earlier to the complementarity between borrower-based measures, such as the Irish mortgage measures, and the CCyB. This complementarity is a further benefit of having both instruments active at the same time, and in one particular aspect deserves some consideration.

Given that residential mortgages account for the majority of Irish banks' total outstanding lending, it is appropriate that the effect of the borrower-based measures on risk taking in the domestic mortgage market is closely monitored. However, approximately 30 per cent of these banks' outstanding Irish loans are to customers in the SME, Corporate, Commercial Real Estate and non-mortgage consumer asset classes. In the context of a broad cyclical expansion, new lending flows are increasingly going towards these portfolios.

None of the above should come as a surprise, given the combination of accommodative monetary policy, a robust economic recovery, and the restrictions imposed by the mortgage measures on the ability of banks to take excessive new risk in their largest asset class. Some country specific research has also shown that when product-specific regulation, similar to the mortgage measures is put in place, banks will expand lending in asset classes not covered by the regulation, such as lending to domestic SMEs, corporates and consumer lending.<sup>21</sup> Even if lending expansion outside the domestic mortgage market has not been *caused* by the introduction of the mortgage measures, it is prudent for the Central Bank to ensure cyclical risks, as they present in the entirety of the banking system, are effectively mitigated. The breadth of the CCyB across all Irish exposures can complement the mortgage measures in that regard.

Another important feature shaping our current thinking on the relative CCyB stance is the introduction of the new IFRS 9 accounting standards at the beginning of the year, which could have potentially important macroprudential side effects. The essence of these standards is that they require banks to provision up-front for any future expected losses. Relative to the previous regime, there is also a broader category of loans subject to higher provisions.<sup>22</sup> Under previous regimes, these loans would have been classified with other, "healthier", performing loans. Under IFRS 9, this is no longer the case.

Counterfactual estimates from our own staff, based on certain assumptions, suggest that had the new regime been in place between 2008 and 2016, the share of performing loans that would have been required to hold higher provisions would have grown in line with the growth in unemployment and the fall in house prices experienced in Ireland. In this case, the share of performing mortgages requiring higher provisions would have reached 50 per cent by 2013.<sup>23</sup> Given that these loans carry a greater provisioning penalty than other performing loans, the analysis suggests there may be a greater degree of pro-cyclicality between the strength of the economy and the provisions and profitability of banks under IFRS 9.<sup>24</sup> If such pro-cyclicality is indeed at play, the likelihood is that when the cycle turns downwards again, credit losses will become more concentrated and immediate, impacting negatively on capital positions and potentially leading to lower credit supply. Having a sufficient buffer in place limits this potential pro-cyclicality.

It may also be the case that the pro-cyclicality of IFRS9 holds in the upswing of the cycle, such that provisioning for certain portfolios may be lower due to favourable economic conditions or strong house price growth, for example. Lower provisions, leading to improved profitability, may then lead to an easing of lending standards and further credit-fuelled economic activity. This

possible pro-cyclical relationship between the economy, asset prices and bank lending represents precisely the type of risk that macroprudential policy makers aim to mitigate.

History has shown that looser management control of dividends may also arise in this instance, which could reduce retained earnings and diminish the potential for capital to be built-up organically during the upswing of the cycle. In order to ensure resilience is built-up as these cyclical risks begin to emerge, a macroprudential policy maker could reasonably be expected to have a higher tendency to increase the CCyB during the upswing of the cycle under IFRS9 than under the previous accounting standards.

Let's now consider the costs, which in the academic literature mostly relate to the potential for higher capital requirements to dampen credit growth and subsequent economic activity.<sup>25</sup> Early activation may result in a short-run cost to economic activity. Alongside this, banks subject to the higher capital requirements may have an incentive to charge higher interest rates to cover the higher cost of equity, which in turn could dampen credit demand.<sup>26</sup>

However, the actual evidence for these shorter-term costs is mixed, and is highly dependent on the level of minimum capital requirements upon introduction. In Ireland, the domestically focused banking system currently has capital levels well in excess of current regulatory minimum requirements. This reflects both legacies of the financial crisis and current challenges in the sector. In these instances, banks would not necessarily have to deleverage by cutting back lending to meet a higher minimum capital requirement.<sup>27</sup> In any case, research by staff in the Central Bank has previously shown that the short-run impact of increased capital requirements on Irish economic activity is relatively small.<sup>28</sup> While there are uncertainties placing a precise value on the short-term benefits and costs, in the longer-term, increasing the margins of safety in an uncertain world is of benefit to all.

In summary, for a variety of reasons related to:

- ♦ Ireland's intrinsic volatility and the scale of legacy debts which increases vulnerability to future cyclical reversals;
- ♦ the likely minimal impact on credit growth and economic activity;
- ♦ measurement and outlook uncertainty alongside data and implementation lags;
- ♦ enhancing the effectiveness of already active macroprudential instruments; and
- ♦ the role of new accounting standards;

the arguments in favour of setting a positive CCyB sufficiently early in the cycle, to build in resilience and mitigate pro-cyclicality in a downturn, are compelling.

## Conclusion

Let me conclude on that point. In the context of emerging broad cyclical risk, the existing vulnerabilities we carry from the last financial crisis, the inherent volatility of the Irish macro-financial environment, and the uncertainty around the short-to-medium term outlook, enhancing resilience should remain at the heart of Irish macroprudential policy. This is certainly the perspective of the Central Bank. Unlike in previous periods where cyclical systemic risks were emerging, this time there is an operational policy framework that may effectively mitigate some of those systemic risks. The Central Bank is committed to using all aspects of that framework as appropriate to safeguard domestic financial stability.

Thank you.

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<sup>1</sup> I would like to thank Martin O'Brien, Fergal McCann, Eoin O'Brien, and Sofia Velasco for their contribution to my

remarks.

- <sup>2</sup> 2 See Department of Finance [Stability Programme Update](#), April 2018.
- <sup>3</sup> 3 See Central Bank of Ireland [Quarterly Bulletin No.2](#), April 2018.
- <sup>4</sup> 4 Recent research has shown that this pace of new lending growth has brought activity in line with its structural determinants. See Enda Keenan and Martin O'Brien (2018) "New mortgage lending activity in a comparative context", Central Bank of Ireland Economic Letter, Vol. 2018 No. 5.
- <sup>5</sup> 5 Owner-occupier mortgage lending is the sum of FTB Purchase, Mover Purchase and Top-up from the [BPF Mortgage Drawdowns Report](#). Gross new lending to SMEs is the total for non-financial sectors from Table A14.1 [Business Credit and Deposits](#), Central Bank of Ireland.
- <sup>6</sup> 6 See the latest [Quarterly Financial Accounts](#) Statistical Release.
- <sup>7</sup> 7 See [Central Bank of Ireland table](#) for Standard Deviation of Annual Growth Rates (%): 1991–2017
- <sup>8</sup> 8 Over the past 3 years, 62 per cent of the invested commercial real estate market was funded by non-Irish resident investors. Meanwhile, non-household purchasers of residential real estate (which would include investment funds) have accounted for 13.4 per cent of transactions since 2015.
- <sup>9</sup> 9 For a discussion see Department of Finance Stability Programme Updates, [April 2017](#) and [April 2018](#), and also [IFAC Fiscal Assessment Report](#), June 2017.
- <sup>10</sup> 10 See [Central Bank website](#).
- <sup>11</sup> 11 See [European Systemic Risk Board website](#).
- <sup>12</sup> 12 Setting of the CCyB is a joint competence with the European Central Bank (ECB). In this instance the ECB have "top-up" powers to increase the rate that is set by the national authority, but it cannot reduce the rate set by the national authority.
- <sup>13</sup> 13 For a full discussion of the conceptual underpinnings see the [BCBS Guidance for national authorities operating the countercyclical capital buffer \(December 2010\)](#), and the [ESRB Recommendation on guidance for setting countercyclical capital buffer rates \(ESRB/2014/1\)](#).
- <sup>14</sup> 14 See Eoin O'Brien and Ellen Ryan (2017) "[Motivating the use of different macroprudential instruments: The countercyclical capital buffer vs. borrower based measures](#)", Central Bank of Ireland Economic Letter, Vol. 2017 No. 15.
- <sup>15</sup> 15 See The Financial Policy Committee's approach to setting the countercyclical capital buffer, April 2016.
- <sup>16</sup> 16 See Lietuvos Bankas (2017) [Countercyclical capital buffer – Background material for decision](#), December 2017.
- <sup>17</sup> 17 The [Finansinspektionen Decision Memorandum](#) (September 2014) outlines the rationale.
- <sup>18</sup> 18 See Jimenez et al (2017), "Macroprudential Policy, Countercyclical Bank Capital Buffers, and Credit Supply: Evidence from the Spanish Dynamic Provisioning Experiments", *Journal of Political Economy*, vol 125(6), and Chen et al (2018), "Empirical Evidence on the Effectiveness of Capital Buffer Release", MPRA Paper No. 84323.
- <sup>19</sup> 19 Matija Lozej and Martin O'Brien, "Timing of changes to the Countercyclical Capital Buffer: Insights from the Central Bank's DSGE model", forthcoming Central Bank of Ireland Economic Letter.
- <sup>20</sup> 20 In instances where the buffer is released it is effective immediately.
- <sup>21</sup> 21 Auer and Ongena (2016) show that when the countercyclical capital buffer was activated in 2012 in Switzerland, focussing solely on domestic mortgage lending, those banks with the largest shares of ex-ante mortgage lending expanded their lending to Swiss enterprises the most. Such research points in the direction of outward spillovers from product-specific regulation.
- <sup>22</sup> 22 Under IFRS9 these are referred to as Stage 2 loans.
- <sup>23</sup> 23 Edward Gaffney and Fergal McCann, "Credit risk under IFRS 9 accounting reforms: an application to Irish



mortgages”, forthcoming Central Bank of Ireland Research Technical Paper.

- <sup>24</sup> Further analysis confirming the likely pro-cyclicality of provisions under IFRS 9 is in Abad, J., and J. Suarez (2017): “Assessing the cyclical implications of IFRS 9: a recursive model,” ESRB Occasional Paper Series 12, European Systemic Risk Board.
- <sup>25</sup> Some relevant literature in this area would include Aiyar, S, Calomiris, C and Weladek, T (2014), ‘Does macro-pru leak? Evidence from a UK policy experiment’, Journal of Money, Credit and Banking, Blackwell Publishing, Vol. 46(1), pages 181–214.
- <sup>26</sup> For a summary of findings, see Table C in [The Financial Policy Committee’s approach to setting the countercyclical capital buffer](#), April 2016.
- <sup>27</sup> The relative role of deleveraging given binding capital requirements on credit supply is discussed in Behn, M, M. Gross, and T. Peltonen, “Assessing the costs and benefits of capital-based macroprudential policy,” Working Paper Series 1935, European Central Bank July 2016.
- <sup>28</sup> Lozej, M, L. Onorante, and A. Rannenberg, “Countercyclical capital regulation in a small open economy DSGE model,” [Research Technical Paper 03/RT/2017 2017](#).