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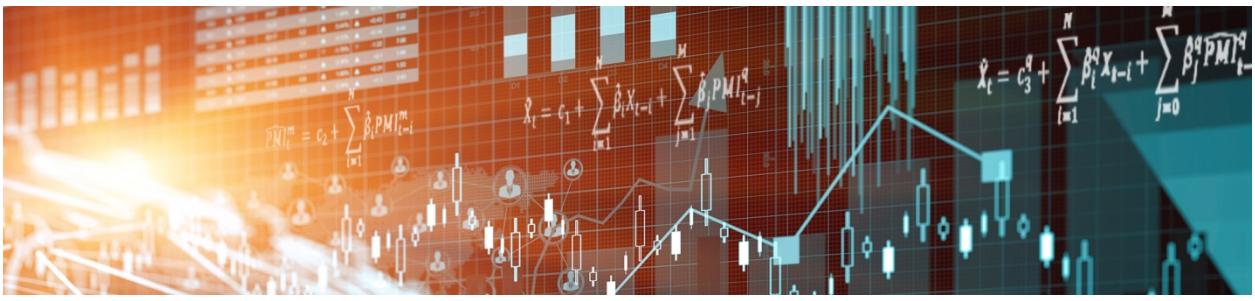
Staff Discussion Paper/Document d'analyse du personnel 2016-11

On the Nexus of Monetary Policy and Financial Stability: Effectiveness of Macroprudential Tools in Building Resilience and Mitigating Financial Imbalances



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Bank of Canada Staff Discussion Paper 2016-11

May 2016

On the Nexus of Monetary Policy and Financial Stability: Effectiveness of Macroprudential Tools in Building Resilience and Mitigating Financial Imbalances

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ISSN 1914-0568

Abstract

This paper reviews the Canadian and international evidence of the effectiveness of macroprudential policy measures in building resilience and mitigating financial imbalances. The analysis concludes that these measures have broadly achieved their goal of increasing the overall resilience of the financial system to the buildup of imbalances and increasing the financial system's ability to withstand adverse shocks. However, evidence of their effectiveness in providing countercyclical stabilization by curbing credit growth ("leaning against the financial cycle") is limited. Among the different types of macroprudential measures, those that are "sectoral" in nature and/or those that target borrowers are most effective in leaning against the financial cycle. Overall, the observed effectiveness of macroprudential tools in addressing systemic risk implies that these policies can be complementary to monetary policy in achieving the goals of macroeconomic and financial stability.

JEL classification: E51, E58, G18, G28
Bank classification: Financial stability; Financial system regulation and policies; Credit and credit aggregates

Résumé

L'objet de cette note est d'évaluer, à partir de données canadiennes et internationales, l'efficacité des politiques macroprudentielles pour renforcer la résilience et réduire les déséquilibres financiers. L'analyse permet de conclure que ces mesures ont atteint l'essentiel des objectifs assignés : augmenter la résilience globale du système financier face aux déséquilibres accrus et accroître sa capacité à résister aux chocs négatifs. Toutefois, l'efficacité de ces mesures pour apporter une stabilité contracyclique en freinant la croissance du crédit (« contrer le cycle financier ») est étayée par des données limitées. De tous les types d'outils macroprudentiels, les mesures de nature « sectorielle » et celles qui visent les emprunteurs sont les plus à même de contrer le cycle financier. Dans l'ensemble, l'efficacité observée des instruments macroprudentiels dans la réduction du risque systémique signifie que ces mesures peuvent être complémentaires de la politique monétaire pour la réussite des objectifs de stabilité macroéconomique et financière.

Classification JEL : E51, E58, G18, G28
Classification de la Banque : Stabilité financière; Réglementation et politiques relatives au système financier; Crédit et agrégats du crédit

Summary

- An important element of the sweeping post-crisis reform of the global financial regulatory and supervisory framework has been the focus on the reduction of systemic risk, which has led to the introduction of various macroprudential measures and tools to strengthen the resilience of the financial system.

- Implemented macroprudential measures in Canada and internationally appear to have broadly achieved their goal of increasing the overall resilience of the financial system to the buildup of imbalances and increasing the system's ability to withstand adverse shocks. Nevertheless, there is also evidence of "leakages" within the system that are at least partially undermining these measures, indicating the need for further analysis and policy adjustments.

- Evidence of the effectiveness of macroprudential policies in providing countercyclical stabilization by curbing credit growth (i.e., "leaning against the financial cycle") is limited.

- Available evidence suggests that "sectoral" macroprudential tools are more likely to be effective in leaning against the financial cycle than "broad-based" tools that aim to affect all credit exposures of the banking system.

- Among the different sectoral measures, those that target borrowers, such as changes in limits to loan-to-value or debt-to-income ratios, seem to be the most effective in leaning against the financial cycle. Sectoral macroprudential measures aimed at the supply of credit can also moderate credit growth, but they are usually less effective because of actions by lenders that remain outside the scope of the regulatory action ("leakages").

- The observed effectiveness of macroprudential tools in addressing systemic risk implies that these policies can be complementary to monetary policy in achieving the goals of price and financial stability.

1. Introduction

Among the several lessons from the 2007–09 global financial crisis, policy-makers have learned that medium-term price stability and macroeconomic stability are not enough to guarantee financial stability, and that financial instability can cause costly and prolonged deviations from inflation targets and full employment. The commonly held view before the crisis was that monetary policy should focus on its price stability mandate and not lean against the financial cycle, that it simply deal with the repercussions of potential crises—mopping—once they occur.[1] The Great Recession, however, demonstrated that monetary policy alone is not powerful enough to quickly restore price and economic stability once they are disturbed by a major financial crisis.

Other policy tools are therefore needed to reduce the probability and impact of such episodes. To that effect, in the aftermath of the global financial crisis, the regulation and supervision of the financial system have been reformed worldwide. An important component of this reform is the design and use of macroprudential policy tools. The success of such reform and the effectiveness of macroprudential tools are critical in determining the extent to which monetary policy needs to take into account financial stability considerations.[2] If they address systemic risk effectively, macroprudential tools can be complementary to monetary policy in achieving the goals of price and financial stability.

The purpose of this paper is twofold. First, it provides a general overview of macroprudential policies by categorizing them according to their ultimate objectives and their scope. Such a categorization is useful in understanding which tools may be more effective in achieving a certain objective. This overview is followed by a discussion of existing evidence of the effectiveness of macroprudential tools in achieving their ultimate goal of increasing the stability of the financial system.

2. Macroprudential Objectives and Tools

The ultimate objective of macroprudential policy is to contribute to the stability of the financial system as a whole by strengthening the resilience of the financial system and decreasing the buildup of systemic risk, while balancing the need for efficient and effective financial intermediation.[3] Although various macroprudential tools have been used in different jurisdictions and under different circumstances, most tools can be categorized according to the type of systemic vulnerabilities that they are meant to address (cyclical vs. structural) and their scope (e.g., broad-based vs. sectoral, and whether they target borrowers or lenders).

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[1] For an example of this view, see Bernanke and Gertler (1999; 2001).

[2] See Gorea, Kryvtsov and Takamura (forthcoming) for a discussion of the merits of monetary policy adjustments in response to financial stability concerns.

[3] Macro- and microprudential perspectives differ in terms of their objectives and understanding of the nature of risk. Traditional microprudential regulation seeks to enhance the safety and soundness of individual financial institutions, in contrast to the macroprudential view, which focuses on the welfare of the financial system as a whole. From a microprudential perspective, risk is taken as exogenous, assuming that the origin of any potential shock triggering a financial crisis is beyond the behaviour of the financial system. Microprudential policy tends to be procyclical in the sense that it tightens during downturns in the credit cycle. Macroprudential policy can involve an overlay of a countercyclical component, possibly using the same microprudential tools (e.g., capital requirements).

2.1 Cyclical vs. structural vulnerabilities

Macroprudential policy can address both the **cyclical** (or time) dimension and the **structural** (or cross-sectional) dimension of systemic risk.[4] The cyclical dimension of systemic risk refers to the buildup of vulnerabilities associated with the financial cycle or credit cycle. A stylized description of the credit cycle helps illustrate the rationale for a macroprudential perspective. During the boom phase of a cycle, overly optimistic risk assessments and eased lending standards system-wide lead to excessive risk taking and leverage, fuelling unsustainable growth in credit and asset prices. These conditions can create imbalances and vulnerabilities across the financial system and set the stage for future financial instability. The structural dimension of systemic risk refers to the point-in-time interconnectedness among financial institutions and markets, as well as to the nature of their common exposure to various credit, market and other risks.

Macroprudential policy tools can be used to safeguard the system by increasing the resilience of the financial system to aggregate systemic shocks by building buffers that absorb their impact and maintain the ability of the financial system to provide credit to the economy. Within a more resilient system, a negative shock will be less likely to cause systemic stress, ultimately reducing the probability and frequency of financial crises. Examples of these policies include the countercyclical capital buffer and dynamic loan loss provisioning. Macroprudential policies can also have a more "ambitious" objective of containing the buildup of systemic vulnerabilities over time—leaning against the financial cycle—by reducing the procyclical feedback between asset prices and credit and containing unsustainable increases in leverage and volatile funding. Examples of these macroprudential policy tools include sectoral capital requirements and lending limits, time-varying limits on debt-to-income (DTI), loan-to-income (LTI) or loan-to-value (LTV) ratios, and policies such as minimum through-the-cycle haircuts that both increase the margin buffer and reduce procyclicality.[5]

From the structural dimension, macroprudential policy seeks to control the buildup of vulnerabilities within the financial system that arise through interlinkages between financial intermediaries and the institutions that play a critical role in key markets, which can render individual institutions too important to fail. Macroprudential policy aims to limit the contagion effects from negative shocks. Some of the tools that address structural aspects include the ability to define the regulatory perimeter, for example, by designating as systemically important institutions, markets and infrastructure, and by imposing systemic risk surcharges through capital, leverage or liquidity surcharges. During the recent financial crisis, an increase in actual and perceived counterparty risk impaired the functioning of key financial markets, with adverse effects on the operations of financial institutions. Stronger market infrastructure—such as central counterparty systems for repos and over-the-counter (OTC) derivatives—reduces counterparty risk and supports the continuous functioning of systemically important markets.

[4] Cyclical measures can be both time-invariant and time-varying. For example, margin requirements can be constant through the cycle or could be adjusted to further limit procyclicality. A time-varying measure presumes that the policy can be adjusted on a timely basis.

[5] DTI, LTI and LTV ratios can also be used as time-invariant policy tools to increase resilience.

2.2 Scope of macroprudential tools

Broad-based macroprudential tools are those that apply system-wide, without targeting specific lenders, borrowers or sectors.[6] Broad-based tools include capital requirements (cyclical or time-invariant), leverage ratio limits, reserve requirements and dynamic provisioning. In contrast, **sectoral** macroprudential tools apply to lenders or borrowers in certain markets or sectors. Limits on LTV or DTI ratios are almost always applied sectorally, although sectoral countercyclical capital buffers, sectoral lending caps and sectoral capital requirements are other examples of sectoral macroprudential tools. As discussed below, sectoral tools are effective in leaning against the cyclical movements in credit growth and asset prices within the sector (e.g., housing), while broad-based tools are often associated with higher resilience.

Some macroprudential tools are designed to affect borrower demand for credit, a common example being LTV and DTI ratio limits. Another example of borrower-based tools is restrictions on credit use, such as higher minimum payment limits on credit cards. Many other macroprudential tools are aimed at financial institutions (i.e., lenders). For example, many of the commonly used macroprudential policies, such as capital requirements, leverage limits and liquidity requirements, are lender-based tools. **Table 1** shows the diversity in macroprudential policies, the vulnerabilities they target and the way that they operate.

[6] Even for broad-based tools, there will be some financial institutions and/or borrowers that will be outside the regulatory perimeter.

Table 1: Vulnerabilities and macroprudential instruments (not exhaustive)

	Vulnerability		Instrument	Objectives
Cyclical dimension	Leverage	Broad-based	Countercyclical capital buffers (Basel)	Enhance resilience (may also moderate credit growth)
			Dynamic loan loss provisions (Spain)	
			Countercyclical simple leverage ratio (Bank of England, Europe)	
		Sectoral	Sectoral capital requirements	
			Limits/caps/rules on debt-to-income, loan-to-income and loan-to-value ratios	
			Countercyclical change in risk weights	
	Funding, liquidity and pricing of risk		Time-varying margin requirements	Reduce liquidity-related systemic risk (can also moderate credit growth)
			Time-varying reserve requirements	
			Levy on bank non-core funding	
Structural dimension	Opacity Interconnectedness Complexity		Define perimeter of regulation (designation as systemically important—institutions, markets and infrastructure)	Increase resilience of too-important-to-fail institutions Reduce excessive exposures within the financial sector
			Concentration limits	
			Information disclosure	
			Systemic capital surcharges (Basel)	
			Systemic leverage ratio surcharges (Bank of England, European Union)	
			Systemic liquidity surcharges	
			Heightened supervision of systemically important financial institutions, markets and infrastructures	
			Changes to market infrastructure (e.g., clearing through central counterparties)	

3. Increasing the Resilience of the Financial System

The effectiveness of macroprudential tools can be measured by their ability to achieve their goal of increasing the financial sector's overall resilience. As discussed above, resilience can be increased by building buffers that absorb the impact of aggregate systemic shocks and ultimately avoid a systemic crisis. Macroprudential policies can be used to create either time-varying (cyclical) or time-invariant (structural), buffers. For example, countercyclical capital buffers are designed to be built up in "good times" and to be released when financial conditions tighten. Similarly, the liquidity coverage ratio (LCR) imposes a liquidity buffer requirement that varies with the amount of short-term funding being used by the bank (IMF 2014). However, macroprudential policy actions such as the global systemically important bank (G-SIB) surcharge or the capital conservation buffer requirement constitute time-invariant buffers.[7]

Macroprudential policies can also increase resilience by addressing structural vulnerabilities such as domestic interconnectedness, external exposure and complexity. If a policy action leads to long-lasting improvements in lending standards and risk-management techniques, the system can be said to be more

[7] For such capital-related tools, the term "time-invariant" is used in the context of the requirements remaining the same across the financial cycle (as a percentage of risk-weighted assets). The size of the buffer will continue to change in relation to the bank's risk-weighted assets.

resilient. Similarly, macroprudential policy tools can result in less complex and ultimately less risky business models for banks. G-SIB surcharges and improved market infrastructure can reduce the risk of contagion and address structural vulnerabilities associated with domestic interconnectedness.

The general consensus is that both broad-based and sectoral macroprudential tools have succeeded in increasing resilience, both by building buffers and by addressing structural vulnerabilities. The Long-Term Economic Impact Group (LTEIG) under the Basel Committee on Banking Supervision (BCBS) finds that a 1 percentage point increase in capital requirements reduces the likelihood of a systemic crisis by 20 to 50 per cent (BCBS 2010). According to the Financial Stability Board (FSB), the minimum total loss-absorbing capacity (TLAC) requirement for G-SIBs decreases the probability of crises by one-third and decreases the GDP cost of crises by 4.6 per cent (FSB 2015). The International Monetary Fund (IMF 2015; Dagher et al. 2016) suggests that the level of loss absorbency implied by a 15 to 20 per cent risk-weighted capital ratio would have avoided at least 80 per cent of the financial crises that have occurred in advanced economies since 1970. According to the studies reviewed by Mora and Januska (2016), a doubling of the risk-weighted capital level from 7 to 14 per cent reduces the annual probability of banking crises from the 4.2–4.6 per cent range to the 0.4–0.6 per cent range. The current capital levels of Canadian banks are in line with all of these ranges, indicating high resilience.[8]

Parallel to the process of building time-invariant buffers through higher capital requirements, the countercyclical capital buffer (CCyB) has been put forth as an additional tool to build up capital in the banking sector in periods when the risks of system-wide stress are growing markedly. As with other capital buffers, the CCyB is likely to increase the resilience of the financial system; however, there is no clear evidence of its ability to reduce credit growth. The CCyB may also present some implementation challenges. For example, while deciding to activate, change or release the buffer, the authorities first assess the level of systemic risk by calculating the deviation of the credit-to-GDP ratio from its long-term trend. However, jurisdictions with operationalized CCyB tools have found that this deviation in the credit-to-GDP ratio can vary based on the methodology being used (Norges Bank 2014), which can complicate the decision-making process. Furthermore, Repullo and Saurina (2012) argue that the countercyclical capital buffer's mechanical reliance on the credit-to-GDP ratio can render it ineffective, if not counterproductive.

Capital requirements have also been used within a sectoral context. Such sectoral capital requirements have been more frequently associated with leaning against the financial cycle, since they tend to work through the price of credit (IMF 2014; Martins and Schechtman 2013). However, they also increase resilience by creating higher capital buffers. In their analysis of Switzerland's sectoral (mortgage) CCyB, Basten and Koch (2015) find that the sectoral CCyB achieved its goal of increasing resilience by shifting mortgage lending away from capital-constrained banks. Following this change in the composition of credit supply, the capital buffers of banks engaged in mortgage lending increased as banks with low capital levels reduced their activities in this sector.

Macroprudential policies other than the above-mentioned capital-related tools can also reduce the probability of crises or decrease the impact of a crisis if it occurs. LTEIG estimates that the introduction of the Net Stable Funding Ratio (NSFR) requirement reduces the likelihood of systemic crises by 10 to 20 per

[8] The Office of the Superintendent of Financial Institutions (OSFI) provides data on the capital ratios of Canadian banks. Please see http://www.osfi-bsif.gc.ca/Eng/wt-ow/Pages/FINDAT.aspx.

cent (BCBS 2010). Jimenez et al. (2015) find that dynamic loan-loss provisioning in Spain helped smooth credit supply cycles and enabled the better-provisioned banks to provide credit during a downturn, mitigating the impact of the crisis.

There is also evidence of macroprudential tools, including some sectoral tools, increasing resilience by addressing structural vulnerabilities. For example, there is cross-country evidence of LTV and DTI ratio requirements being associated with lower default rates during downturns in the housing market, which dampen fire-sale dynamics (IMF 2014). It is possible that such low default rates are partially driven by banks improving their lending standards after the introduction of the LTV and DTI measures.[9] According to Morgan Stanley/Oliver Wyman (2015), the new macroprudential regulations have forced banks to manage risk more prudently. As a result, banks have reduced the scale of their capital-intensive and risky business activities, such as investment banking and market making. By reducing the complexity of business models and by improving risk-management practices, macroprudential policies have successfully increased resilience, although it is difficult to empirically measure the presence and magnitude of these effects.

An important caveat in the ability of macroprudential tools to build resilience is the issue of leakages (policy action undermined by the actions of agents unaffected by the policy), regulatory avoidance (agents within the regulatory perimeter able to reduce the impact of the policy action), and the need for international policy coordination (because the effectiveness of policies in one jurisdiction is linked to actions in other jurisdictions).

Broad-based macroprudential actions such as higher capital requirements can shift lending activity away from institutions that are subject to the regulation to those that are outside the regulatory perimeter. These institutions can include domestic non-bank lenders (shadow banks) or foreign bank lenders. For example, Aiyar, Calomiris and Wieladek (2014) find that while regulated UK banks reduced their lending activity in response to tighter capital requirements, unregulated foreign bank branches increased their lending.[10] Although the ability of foreign bank branches to cause such leakages in Canada is unlikely because of restrictions to their activities, leakages through domestic non-banks can undermine the resilience that macroprudential tools are building, if they result in shifting lending activity away from better-capitalized lenders toward capital-constrained institutions. Similarly, as banks divest from non-core businesses, some of these activities can be captured by non-regulated, non-banking entities. Such leakages can be addressed by expanding the regulatory perimeter to include domestic non-banks and also by giving the host country more regulatory power over foreign bank branches. Alternatively, reciprocity arrangements could prevent foreign

[9] In addition, while studying a sectoral capital requirement on auto lending in Brazil, Martins and Schechtman (2013) find that spreads on affected auto loans increased when the sectoral capital requirement was introduced, only to decrease again with the removal of the measure. However, the decrease in the spreads was smaller than the initial increase in relative terms, suggesting a long-lasting change in Brazilian banks' risk-management techniques associated with such loans. Similarly, Agarwal, Hadzic and Yildirim (2015) find that the borrowing and spending patterns of higher-risk borrowers in Turkey were most affected by the macroprudential actions aimed at curbing credit card loans. Again, this finding could point to a structural improvement in lending standards and risk-management techniques, increasing the resilience of the sector. In contrast, Basten and Koch (2015) do not find any evidence of higher-risk borrowers being excluded from the mortgage market as a result of the sectoral countercyclical capital buffer in Switzerland.

[10] Using a cross-country sample, Reinhardt and Sowerbutts (2015) confirm that capital requirements (a broad-based tool) "leak," although they do not find any leakages associated with sectoral tools, such as LTV ratio limits. Damar and Mordel (forthcoming) also find evidence of cross-border macroprudential policy spillovers involving large Canadian banks.

bank branches from playing a role in macroprudential leakages (IMF 2014) by ensuring that the regulators in the home country of the foreign branches ensure their compliance with the host country policy.

Bank avoidance of regulations is another concern related to the effectiveness of certain macroprudential tools in building resilience. For example, banks can adjust risk weights in response to a tightening of capital requirements, effectively circumventing the requirement to raise capital buffers (also called "gaming effects").[11] However, a leverage limit used in conjunction with risk-weighted capital requirements can constrain such behaviour and result in appropriate reporting of risk weights (Blum 2008).

Finally, even if a macroprudential tool is able to increase resilience, challenges at the implementation stage can reduce its effectiveness. Implementation challenges can arise both domestically and in international settings. Without a clear domestic macroprudential policy framework and/or governance structure, a macroprudential policy action may prove difficult to implement, even if it has a high probability of success. Such delays in implementation can compromise the timely and effective use of macroprudential tools.[12]

4. Leaning Against the Financial Cycle

In contrast to their well-documented effectiveness in increasing resilience, it is not clear whether macroprudential tools can effectively achieve the goals of leaning against the financial cycle. In this paper, the cyclical effectiveness of macroprudential tools is measured primarily by their ability to slow down credit growth.[13]

The available empirical evidence suggests that sectoral macroprudential tools are more effective in curbing credit growth than broad-based tools are. The findings of two recent studies that use cross-country data to analyze the impact of macroprudential tools on credit growth (Cerutti, Claessens and Laeven 2015; Akinci and Olmstead-Rumsey 2015) show that sectoral tools are most effective in curbing credit growth, at least in advanced economies. Furthermore, among different sectoral tools, limits on DTI and LTV ratios are especially effective at curbing the growth of household credit.[14]

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[11] Much of the discussion of regulatory avoidance has been related to capital requirements. It has been argued that the complex nature of risk-based capital requirements can reduce the supervisors' ability to accurately assess banks' risk assessments, creating opportunities for banks to "game" the rules (Dermine 2015; Blum 2008). Such concerns are not limited to broad-based capital requirements. IMF (2014) discusses the case of Sweden, where banks increased risk weights on mortgages in anticipation of a regulatory-mandated minimum. At the same time, however, they decreased risk weights on commercial loans, reducing the resilience-building impact of the policy action.

[12] For example, according to the Central Bank of Ireland (2010), hesitation by the financial regulator (in charge of macroprudential tools), lengthy consultative procedures and ineffective sharing of expertise between the financial regulator and central bank staff resulted in delayed and "watered down" implementation of macroprudential tools during the 2006–07 period. As a result, the macroprudential policy actions were deemed to be "too little, too late" to have any meaningful impact.

[13] Certain macroprudential tools, especially those targeting the housing sector (such LTV or DTI ratio limits), can lean against the cycle by affecting prices. Existing evidence of macroprudential tools affecting house price growth is somewhat mixed. Cerutti, Claessens and Laeven (2015) and Jacome and Mitra (2015) find limited links between macroprudential policies and house prices, while Akinci and Olmstead-Rumsey (2015), Crowe et al. (2013) and Krznar and Morsink (2014) conclude that housing-related macroprudential tools slow down growth in house prices.

[14] Restrictions on foreign currency lending can also be effective in leaning against the household credit cycle, even in advanced economies (Cerutti, Claessens and Laeven 2015). However, it is unclear how relevant this tool may be in the Canadian context.

Existing work on housing-related macroprudential policies in Canada suggest that these tools have the ability to lean against the cycle. Using a combination of micro and aggregate macro data, Allen et al. (forthcoming) examine various macroprudential loosening and tightening episodes for the 2006–11 period. Although it does not explicitly analyze growth in mortgage credit, this study finds that macroprudential housing tools can effectively stimulate *or* dampen demand. Such changes in demand are likely to translate into changes in mortgage credit growth. However, housing-related macroprudential tools are found to be useful only if they directly affect either the wealth or the income constraints of households.

Looking at the 2008–12 period, Kuncl (forthcoming) also analyzes the impact of housing-related macroprudential tightening on the growth of aggregate residential mortgage credit and residential investment. Using both descriptive and econometric approaches, Kuncl finds that while macroprudential actions have led to slower growth in credit and investment, the effects were not always immediate. Nevertheless, the effect of macroprudential tightening appears to be persistent once it is realized, suggesting that the policies are effective, even if they may not be fully addressing the suspected imbalances in mortgage and housing markets. The findings of these Bank of Canada staff research papers are broadly consistent with external studies such as Krznar and Morsink (2014).

The fact that borrower-based macroprudential housing tools can effectively lean against the financial cycle in Canada is part of a broader pattern. The experiences of other jurisdictions also suggest that borrower-based sectoral tools are usually quite effective in leaning against the cycle. Igan and Kang (2011) find that tighter LTV and/or DTI ratio limits in South Korea were followed by a significant drop in housing transactions. Similarly, after Turkey took a series of borrower-based macroprudential policy actions aimed at household credit, such as higher minimum payment requirements and limits on cash withdrawals from credit cards, there was a significant decline in spending by highly indebted households (Agarwal, Hadzic and Yildirim 2015).

In contrast, lender-based sectoral tools have been effective in leaning against the cycle in some cases, but not others. For example, higher capital requirements on high LTV ratios and/or long-maturity personal loans in Brazil significantly reduced the growth rate of household credit, while higher risk weights and higher provisions for consumer loans had a similar impact in Turkey.[15] However, Crowe et al. (2013) report that sectoral capital requirements or higher sectoral risk weights failed to slow down the growth of household debt (mortgage or otherwise) in Bulgaria, Croatia, Estonia and Ukraine. As discussed, Basten and Koch (2015) find evidence of increased resilience following the introduction of the sectoral (mortgage) countercyclical capital buffer in Switzerland; however, they find no evidence of a slowdown in mortgage credit growth.

Although sectoral macroprudential tools aimed at corporate loans have been used in emerging markets, the main goal of these actions has been to curb foreign currency borrowing by non-bank firms and to reduce foreign exchange risk. Examples of countries adopting this approach include Croatia, Turkey and India.

[15] According to the IMF (2012a), the annual growth rate of household credit in Brazil fell from 22 per cent to 11 per cent as a result of these macroprudential policies. This slowdown in credit growth is likely due to the sharp increase in interest rates that banks charged on loans affected by the sectoral capital requirement, as discussed by Martins and Schechtman (2013). Meanwhile, the IMF (2012b) reports that the higher risk weights and provisions in Turkey resulted in a significant decline in credit growth.

Besides building resilience, broad-based macroprudential policy tools, such as capital requirements, can sometimes lean against the cycle as well. One piece of empirical evidence for such leaning is provided by Aiyar, Calomiris and Wieladek (2014), who conclude that tighter capital requirements reduced credit growth in the United Kingdom. While it is theoretically possible that tightening macroprudential liquidity tools can increase bank lending spreads and therefore slow down credit growth, currently there is no empirical evidence (or case studies) documenting the ability of these tools to lean against the cycle.

Looking across emerging markets and developing economies, some studies have found that time-varying reserve requirements can be effective in leaning against the financial cycle (Akinci and Olmstead-Rumsey 2015; Cerutti, Claessens and Laeven 2015).[16] However, since reserve requirements work as a tax on banks, leading to higher lending rates and lower credit growth, they are more likely to be effective in the mainly bank-based financial systems of emerging markets and developing economies. In advanced economies, where non-bank lenders play a greater role, the effectiveness of this tool is likely to be significantly less.

As with structural vulnerabilities, the effectiveness of macroprudential tools to address cyclical vulnerabilities is greatly dependent on the risk of leakages. If macroprudential policy actions designed to lean against the credit cycle result in the provision of credit migrating to unaffected institutions (domestic or multinational), this can render the policy less effective. For example, Aiyar, Calomiris and Wieladek (2014) conclude that almost one-third of the reduction in credit growth in the United Kingdom through tighter capital requirements was offset by leakages.[17] The international economic conditions and the size of the country undertaking the policy actions also play a role in whether leakages dampen the cyclical effectiveness of macroprudential tools. If the financial cycle is partly driven by demand from foreign investors (for example, real estate purchases by foreign investors driving up house prices and leading to faster growth in mortgage credit), even macroprudential policies aimed at borrowers will be subject to leakages and be less effective.

5. Conclusion

The introduction of macroprudential policies has been an important feature of the post-crisis overhaul of the financial system regulatory and supervisory framework. The goal of macroprudential policies is to address vulnerabilities (cyclical or structural) by both strengthening the resilience of the financial system and leaning against the financial cycle.

Available evidence suggests that macroprudential measures are broadly achieving their goal of increasing the overall resilience of the system. The system is becoming more resilient both through the building of buffers that absorb shocks and also through a reduction in structural vulnerabilities (such as domestic interconnectedness or overly complex business models). Given the increased resilience of the system, the probability and impact of financial stress is less and the need for monetary policy to lean against the financial cycle or to mop up after a period of financial stress appears to be reduced. However, there is also

[16] IMF (2012a) provides additional details on the use of reserve requirements as a macroprudential tool in emerging markets and developing economies. For example, a series of reserve requirements in Brazil during the post-crisis period led to a moderate but transitory decline in credit growth. Meanwhile, in Turkey, the central bank used reserve requirements as a "first line of defence" financial stability tool, without other, more "traditional" macroprudential policies in its tool kit.

[17] IMF (2014) provides additional examples of leakages in emerging markets, for example, leakages that undermined foreign currency lending in Turkey and a variety of sectoral macroprudential actions in Croatia.

substantial evidence of leakages within the system that are partially undermining the effectiveness of macroprudential measures. This is an area that is likely to require additional attention.

Meanwhile, macroprudential policies are less successful in achieving their more ambitious goal of leaning against the financial cycle. Based on this finding, the argument can still be made that monetary policy has a role to play in slowing down the growth of financial imbalances, although current research suggests that the costs of doing so could outweigh the benefits. While sectoral macroprudential tools, especially those that target borrowers, have been successful in curbing credit growth (both in Canada and in other jurisdictions), broad-based tools have not proven to be as effective. Another potential area for future analysis is determining whether this divergence in the leaning ability of different macroprudential tools is due to leakages or differences in the nature of the tools themselves or is driven by implementation issues.

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