Macroprudential policy and credit supply cycles

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Western Europe and the United States have recently experienced a major banking crisis, followed by a severe economic recession with significant costs in terms of aggregate output and employment. These phenomena are not unique: banking crises are recurrent phenomena, triggering deep and long-lasting recessions. The main channel by which weaknesses in banks' balance sheets affect the real economy is via a reduction in the supply of credit, i.e. a credit crunch. Importantly, banking crises are not random events that stem from exogenous risks, but arise after periods of very strong private credit growth. Therefore, for systemic risk, it is crucial to understand the determinants and implications of credit in good and bad times – the so-called credit cycles. This paper analyses the relationship between credit cycles and systemic risk and, in particular, whether macroprudential policies affect credit supply cycles (i.e. credit cycles stemming from credit supply rather than demand). Moreover, the author reviews the impact on credit supply from one macroprudential policy: countercyclical bank capital requirements (based on the Spanish dynamic provisioning).

NB: José-Luis Peydró is also Professor of Banking and Finance at Cass Business School, City University, London, Affiliated Professor at Barcelona Graduate School of Economics and Research Fellow of the Centre for Economic Policy Research. Email: jose.peydro@upf.edu. *This article is mainly based on author's book (with Xavier Freixas and Luc Laeven,* forthcoming*) on systemic risk and on author's papers on credit cycles and systemic risk, in particular: Iyer and Peydró (2011), Jiménez* et al. *(2012), Jiménez* et al. *(*forthcoming*), Jiménez, Ongena, Peydró and Saurina (2013), Jiménez, Mian, Peydró and Saurina (2013), Iyer* et al. *(*forthcoming*), Maddaloni and Peydró (2011 and 2013), Ciccarelli, Maddaloni and Peydró (2013a and 2013b) and Peydró (2013). These are author's views and do not necessarily reflect those of co-authors.*

Western Europe and the United States have recently experienced a major banking crisis, followed by a severe economic recession with significant costs in terms of aggregate output and employment. These phenomena are not unique: banking crises are recurrent phenomena, triggering deep and long-lasting recessions.[1] The main channel by which weaknesses in banks' balance sheets affect the real economy is via a reduction in the supply of credit, i.e. a credit crunch. Importantly, banking crises are not random events that stem from exogenous risks, but arise after periods of very strong private credit growth. Therefore, for systemic risk, it is crucial to understand the determinants and implications of credit in good and bad times – the so-called credit cycles.

Given the externalities of credit cycles for systemic risk, it is crucial to understand how macroprudential policy, in particular countercyclical capital requirements, affects the supply of bank credit in good and bad times.[2] The damaging real effects associated with financial crises has generated a broad agreement among academics and policymakers that financial regulation needs to acquire a macroprudential dimension that ultimately aims to lessen the potentially damaging negative externalities from the financial to the macroeconomic real sector, as for example in a credit crunch. Countercyclical macroprudential policy tools could be used to address these cyclical vulnerabilities in systemic risk, by slowing credit growth in good times and especially by boosting it in bad times. Under the new international regulatory framework for banks – Basel III – regulators agreed to vary minimum capital requirements over the cycle, by instituting countercyclical bank capital buffers (i.e. procyclical capital requirements). As part of the cyclical mandate of macroprudential policy, the objective is for capital requirements to increase during booms and decrease during busts, thus increasing the capital buffers that banks have when a crisis hits.

Introducing countercyclical bank capital buffers aims to achieve two macroprudential objectives at once. First, boosting equity or provisioning requirements during booms provides additional buffers in downturns that help mitigate credit crunches. Second, higher requirements on bank own funds can cool credit-led booms, either because banks internalise more of the potential social costs of credit defaults (through a reduction in moral hazard by having more "skin in the game") or charge a higher loan rate due to the higher cost of bank capital. Countercyclical bank capital buffers could therefore lessen the excessive procyclicality of credit, i.e. those credit supply cycles that find their root causes in banks' agency frictions. Smoothing bank credit supply cycles will generate positive firm level real effects if bank-firm relationships are valuable and credit substitution for firms is difficult in bad times.

Despite the significant attention now given by academics and policymakers alike to the global development of macroprudential policies, except for that of Jiménez, Ongena, Peydró and Saurina (2013), no empirical study has so far estimated the impact of countercyclical capital requirements on the supply of credit and on real activity. One interesting example is the series of pioneering policy experiments with dynamic provisioning in Spain: from its introduction in 2000 and modification in 2005 during good times, to its amendment and response in 2008 when a severe crisis shock struck causing bad times.

First, I will briefly analyse credit supply in good times, its implications for the endogenous building-up of excessive bank risk-taking, and I will also analyse credit supply during financial crises. Second, based on Jiménez, Ongena, Peydró and Saurina (2013), I will summarise the main results of our paper on the Spanish experience with dynamic provisioning on credit supply over the period 2000-2013.

1| Credit supply cycles, moral hazard and systemic risk

Schularick and Taylor (2012) (and their following papers with Oscar Jordà) show that ex ante credit growth is strongly correlated with the likelihood of a financial crisis, and conditional on a crisis, the real effects are worse when a credit boom

1 *See Kindelberger (1978) and Reinhart and Rogoff (2008) for historical evidence.*
2 *Systemic risk is defined, based on Freixas, Laeven and Peydró (2014), as "the risk of threats to financial stability that impair the functioning of the financial system as a whole with significant adverse effects on the broader economy."*

precedes the crisis.[3] For a sample of fourteen major developed countries over the last 140 years, they find that the cycles in credit growth consist of periods during which the economy is performing well and credit growth is robust (on average 7%) and periods when the economy is in recession and credit contracts (on average –2%).

Credit cycles stem from either: (i) non-financial borrowers' agency frictions and investment opportunities (credit demand) as in, for example, Kiyotaki and Moore (1997), Lorenzoni (2008), and Jeanne and Korinek (2010), where better investment opportunities or the higher value of the collateral and net worth of firms and households result in higher credit, or (ii) banks' agency frictions (credit supply) as in, for example, Rajan (1994), Holmstrom and Tirole (1997), Diamond and Rajan (2006 and 2011), Allen and Gale (2007), and Adrian and Shin (2011), where changes in bank capital, liquidity and competition allow changes in credit supply.

The main explanation of credit supply cycles is based on an agency view.[4] The agency view highlights agency problems at the core of the build-up of systemic risk that have to do with the difficulties in aligning the incentives between the principal (for instance, bank bondholders or the taxpayers) and the agent (bank managers or shareholders). First, the basic agency problem stems from the fact that most financial intermediaries have limited liability (their losses are limited) and invest money on behalf of others (the final investors). Moreover, they are highly leveraged, notably banks that are funded almost entirely with debt. These frictions create strong incentives for excessive risk-taking as there is little skin in the game for bank shareholders but high potential upside profits. Second, excessive risk-taking notably increases when there are explicit and implicit guarantees and subsidies from the government (taxpayers) in the event of negative ex-post risks (such as a financial crisis). This increases the ex-ante agency problems of financial intermediaries as financial gains are privatised, but losses are in great part socialised. The agency view implies that, in good times, when banks have abundant liquidity they may undertake excessive risky lending projects, as they do not fully internalise the potential loan defaults or the externalities to taxpayers and other banks. In bad times, banks enter the crisis with little capital at stake, which leads to less bank liquidity, thereby causing a potential credit crunch in the economy, with negative real effects.[5]

2| Empirical evidence

Dynamic provisions – initially also called "statistical" later on "generic" provisions as a statistical formula is mandating their calculation that is not related to bank-specific losses – are forward-looking provisions that, before any credit loss is recognised on an individual loan, build up a buffer (i.e. the dynamic provision fund) from retained profits in good times that can then be used to cover the realised losses in bad times. The buffer is therefore countercyclical. The required provisioning in good times is over and above specific average loan loss provisions and there is a regulatory reduction of this provisioning (to cover specific provision needs) in bad times, when bank profits are low and new shareholders' funds through for example equity injections are costly. Dynamic provisioning has been discussed extensively by policy makers and academics alike and dynamic provision funds are considered to be Tier 2 regulatory capital.

I provide here a summary of Jiménez, Ongena, Peydró and Saurina (2013), where we analyse: (i) the introduction of dynamic provisioning in Q3 2000, which by construction entailed an additional non-zero provision requirement for most banks, but – and this is crucial for our estimation purposes – with a widely different formula-based provision requirement across banks;[6] and (ii) one policy experiment is in bad times (the sudden lowering of the floor of the dynamic provision

3 *Granted credit is not as forward-looking as change in the supply of committed credit as it is also affected by credit demand, notably drawn from existing credit lines; instead, change in lending standards from lending surveys is more forward-looking (see Maddaloni and Peydró, 2011 and 2013).*
4 *Another important view is the preference channel, in particular behavioural biases (see Stein, 2013 and Freixas* et al.*, 2014).*
5 *See Iyer and Peydró (2011), Jiménez* et al. *(2012), Jiménez* et al. *(2014), Jiménez, Mian, Peydró and Saurina (2013), Iyer* et al. *(2014), Ciccarelli, Maddaloni and Peydró (2013a and 2013b), and the references therein.*
6 *We also analyse a modification that took place in Q1 2005, which led to a net modest loosening in provisioning requirements for most banks, and a shock in 2011 that tightened provisioning requirements. See the paper. In the paper we also analyse further heterogeneous effects across firms and banks.*

funds in Q4 2008 from 33 to 10 percent such that the minimum stock of dynamic provisions to be held at any time equals 10 percent of the latent loss of total loans, which allowed for a greater release of provisions, and hence a lower impact on the profit and loss of the additional specific provisions made in bad times) and concurrently the (mostly unforeseen) crisis shock in Q3 2008, where we analyse the workings of the dynamic provision funds built up by banks as of Q4 2007.

To identify the availability of credit we employ a comprehensive credit register that comprises loan (i.e. bank-firm) level data on all outstanding business loan contracts, loan applications for non-current borrowers, and balance sheets of all banks collected by the supervisor. We calculate the total credit exposures of each bank to each firm in each quarter, from Q1 1999 to Q4 2010. Hence the sample period includes six quarters before the first policy experiment (essential to run placebo tests) and more than two years of the financial crisis. We analyse changes in committed credit volume, on both the intensive and extensive margins, and also credit drawn, maturity, collateral and cost. By matching firm balance sheets with the business mortality register, we can also assess the effects on firm-level total assets, employment and survival.

Depending on their credit portfolio (i.e. the fraction of consumer, public sector and corporate loans mostly) banks were differentially affected by the policy experiments. Therefore, we perform a difference-in-differences analysis where we compare before and after each shock differently affected banks' lending at the same time to the same firm. Though we analyse the same bank before and after the shock, we further control for up to thirty-two bank variables and also key bank-firm and loan characteristics.

In good times we find that banks that have to provision relatively more (less) cut committed credit more (less) to the same firm after the experiment – and not before – than banks that need to provision less (more). These findings also hold for the extensive margin of credit continuation and for credit drawn, maturity, collateral, and credit drawn over committed (as an indirect measure of the cost of credit). Hence, procyclical bank capital regulation in good times cuts credit availability to firms.[7]

But are firms really affected in good times by the average shock to the banks that they were borrowing from before the shock? We find that this is mostly not the case. Though total committed credit received by firms drops almost immediately following the introduction of dynamic provisioning (and commensurately increases following its modification), three quarters after the policy experiments there is no discernible contraction of credit available to firms. Accordingly, we find no impact on firm total assets, employment, or survival, suggesting that firms find ample substitute credit from less affected banks (both from new banks and from banks with an existing relationship) and from other financiers.

In bad times the situation appears very different. Banks with dynamic provision funds close to the floor value in Q4 2008 (and hence that benefited most from its lowering in the third policy experiment) and banks with ample dynamic provision funds just before the start of the crisis permanently maintain their supply of committed credit to the same firm after the shock at a higher level than other banks. Similar findings hold for credit continuation, drawn and drawn over committed (i.e. at a lower cost of credit). At the same time these banks shorten loan maturity and tighten collateral requirements, possibly to compensate for the higher risk taken by easing credit volumes during the crisis.[8]

7 *Results are robust to numerous perfunctory alterations in the specification (e.g. adding bank and loan characteristics and firm*bank type fixed effects), the sample (e.g. restricting it to firms with balance sheet information), and the level of clustering of the standard errors (e.g. multi-clustering at the firm and bank level). Even though for the first policy experiment for example we apply the dynamic provision formula to each bank's credit portfolio in Q4 1998, rather than in Q3 2000 when the policy became compulsory for all banks, usual endogeneity concerns could persist. Policy makers capable of accurately predicting the aggregate and especially heterogeneous changes in bank credit could have devised the formula to maximise the credit impact for example. In that case excluding either the savings banks (that are often of direct interest to politicians) or the very large banks (i.e. four banks that represent almost 60 percent of all bank assets), and instrumenting realised bank provisions with the formula-based provisioning on the basis of banks' past loan portfolios (shown not to be a weak instrument) allays any remaining endogeneity concerns as the estimates are not affected.*

8 *Results are again robust to alterations in the specification, the sample, the level of clustering of the standard errors, and to the exclusion of the very large banks. Importantly, given that more cautious banks could choose levels of provisioning higher than those stemming from regulation, the results are robust to the instrumentation of the (potentially endogenous) dynamic provision funds in Q4 2007 with the formula-based dynamic provision funds required for the bank's portfolio for as far back as Q3 2000!*

Even more strikingly different in bad times than in good times is that the changes in loan level credit are binding at the firm-level, i.e. credit permanently contracts especially for those firms that borrowed more from banks that at the start of the crisis had lower dynamic provision funds. Hence, firms seemingly cannot find a substitute for the lost bank financing. Indeed, we find that the granting of loan applications to non-current borrowers in bad times is almost 30 percent lower than in good times. Consist with this interpretation we find that firm total assets, employment, or survival are negatively affected as well.

The estimates are also economically relevant. Following the crisis shock, firms with banks whose dynamic provision funds is 1 percentage point higher (over loans) prior to the crisis obtain credit growth that is 6 percentage points higher, growth that is 2.5 percentage points higher asset, employment growth that is 2.7 percentage points higher, and a likelihood of survival that is 1 percentage point higher.

All in all, Spain introduced dynamic provisioning unrelated to specific bank loan losses in 2000 and modified its formula parameters in 2005 and 2008. In each case, individual banks were impacted differently. The resulting bank-specific shocks to capital buffers, coupled with comprehensive bank-, firm-, loan-, and loan application-level data, allow us to identify its impact on the supply of credit and on real activity. The estimates show that countercyclical dynamic provisioning smoothes cycles in the supply of credit and, in bad times, strongly upholds firm financing and performance. Therefore, the very large positive effects of countercyclical capital requirements for the macroeconomy appear in crisis times, when accessing equity markets for banks is costly, bank profits are low, and the substitution of financial sources for non-financial firms and households is difficult.

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