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The role of capital requirements and credit composition in the transmission of macroeconomic and financial shocks[☆]

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ABSTRACT

This paper builds a general equilibrium model that incorporates a bank, borrowing constraints, default and an exogenous capital requirement to study the effect of the latter on the composition of bank funding and on the response of the economy to shocks. Ex-ante heterogeneous households decide how much to save or borrow for the sake of consumption (consumer credit) or the provision of housing services(mortgages). These choices are subject to borrowing limits, which depend on the value of real estate assets (for mortgages) or labour income (for consumer loans). The model includes a final good producer and a continuum of intermediate goods producers who must borrow in order to finance working capital/labour requirements (business credit borrowing) and are subject to nominal rigidities. Saving and borrowing are intermediated by a bank facing exogenous capital requirements that differ for each credit category. Capital requirements are modelled as a penalty function following Den Haan and De Wind (2012). The paper focuses on the response of the model economy to monetary, productivity and financial shocks with or without capital requirements. In the absence of capital requirements, any shock that reduces the deposit rate will incentivize the bank to switch away from bank capital into deposits, thus increasing the demand for deposits and dampening the effect of the shock on interest rates and the price of housing services. The main effect of capital requirements in the model is to disrupt the ability of the bank of switching to cheaper funding sources (deposits) after a shock. Capital requirements thus have the effect of amplifying the response of aggregate variables to shocks through the composition of the right-hand side of the balance-sheet of the bank, and not through the well-studied channel of leverage constraints affecting its left-hand side.

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El papel de las necesidades de capital y la composición de los créditos en la propagación de los choques macroeconómicos y financieros

RESUMEN

Este documento desarrolla un modelo de equilibrio general que incorpora un banco, restricciones de endeudamiento, incumplimiento y necesidad de capital exógeno para estudiar el efecto de este último en la composición de la financiación bancaria y en la respuesta de la economía a los choques. Los hogares heterogéneos previamente deciden cuánto ahorrar o pedir prestado para consumir (crédito al consumo) o para la provisión de servicios de vivienda (hipotecas). Estas opciones están sujetas a límites de endeudamiento, que dependen del valor de los activos inmobiliarios (para las hipotecas) o de los ingresos laborales (para los préstamos al consumo). El modelo incluye un productor del bien final y un continuo de productores de bienes intermedios que deben tomar prestado para financiar capital de trabajo/necesidades de mano de obra (préstamos de crédito comercial) y están sujetos a rigideces nominales. El ahorro y el endeudamiento se gestionan por parte de un banco que se enfrenta a necesidades de capital exógeno que difieren en cada categoría de crédito. Las necesidades de capital se han creado tomando como modelo una función de penalización según Den Haan and De Wind (2012). El documento

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se centra en la respuesta de la economía del modelo a los choques monetarios, productivos y financieros con necesidades de capital o sin ellas. En ausencia de necesidades de capital, cualquier choque que reduzca la tasa de depósito incentivará al banco a cambiar de capital bancario a depósitos, aumentando así la demanda de depósitos y amortiguando el efecto del choque sobre las tasas de interés y el precio de los servicios de vivienda. El principal efecto de las necesidades de capital en el modelo es interrumpir la capacidad del banco de cambiar a fuentes de financiación más baratas (depósitos) después de un choque. Las necesidades de capital, por tanto, tienen como efecto amplificar la respuesta de las variables agregadas a los choques a través de la composición de la parte derecha del balance del banco y no a través del bien estudiado canal de restricciones sobre la capacidad de influir que afectan a su parte izquierda.

How do capital requirements affect bank behavior along the business cycle? Are capital requirements capable of delivering a more stable macroeconomic environment in the face of shocks? General interest on these questions has increased since the onset of the recent financial crisis, and particularly since the Basel Committee on Banking Supervision (BCBS) gave a prominent role to macroprudential policy tools in the principles established in the regulatory framework widely known as Basel III.

Empirical literature on the effects of macroprudential policy and its interaction with the business cycle has been limited due to the small number of countries that have adopted any form of macroprudential tool and to the yet relatively short experience with their use. Considering dynamic provisioning and countercyclical capital buffers (two widely discussed tools highlighted by Basel III), 119 countries have adopted either of them (all of them after 2005), and only two have introduced both.[1] Up to this point, good sources of exogenous variation are relatively scarce, making it difficult to establish a successful empirical identification strategy. As a result, theoretical models offer more fertile grounds for obtaining insights into the functioning and effects of macroprudential policy tools.

This paper attempts to tackle those questions by building an equilibrium model of the macroeconomy that incorporates a bank, financial frictions, default and capital requirements. The model incorporates the decisions of patient and impatient households who make choices on optimal levels of consumption, work and enjoyment of housing services. Households also decide how much to save or borrow for the sake of consumption (consumer credit borrowing) or the provision of housing services (mortgage credit borrowing). Borrowing for either purpose is subject to credit constraints: the amount borrowed is constrained by the expected value of labour income or the stock of housing services. The model also includes intermediate and final goods producers; it is assumed that the former must borrow in order to finance working capital requirements (business or commercial credit borrowing). Saving and borrowing is intermediated by a bank facing capital requirements that differ for each of the three credit categories (consumer, mortgage, business). In addition, each type of borrowing has a different probability of default which depends on aggregate conditions. Finally, the model includes a Central Bank/Regulator who sets the interest rate on deposits and exogenously decides on capital requirements.

Contrasting with earlier work on equilibrium models with financial frictions, this paper employs a penalty function following Den Haan and De Wind (2012) in order to model minimum capital requirements. More specifically, the model introduces a cost to the bank which depends on the distance between observed and required capital. The parameters of the penalty function are chosen so that this cost becomes prohibitively high as observed capital converges from the right to the minimum, and is negligible otherwise. Compared to occasionally binding leverage constraints, this specification is easier and quicker to compute and it is flexible enough to allow for changes to the specific form of macroprudential policy/capital requirements. As such, it offers a promising strategy to deal with this type of constraints in equilibrium models. In addition, taking into account the wide variation in business cycle properties across different credit categories, the model introduces a non-trivial choice of credit composition for the bank. Total credit in the model corresponds to the aggregation of consumer, business and mortgage loans. The choice of loan supply for each of these credit segments takes into account their individual interest rates and their (endogenous) default rates. Loan supply will also depend on the regulatory requirements of each credit segment in terms of bank capital.[2]

The paper focuses on the examination of the impulse-response functions of the model to study how the equilibrium relationship between the real economy and the financial system (the bank) changes in response to shocks. By comparing the response of the economy with or without capital requirements (that is, with or without the penalty function) it is also possible to discern whether this policy instrument contributes to deliver a smoother response of the economy to different shocks. The paper will specifically focus on the effect of capital requirements on the composition of bank funding as a main driver of the response of the economy to shocks. Given that risk (probability of default) is orthogonal to the choices of the bank, the model does not feature the standard, risk-taking channel studied elsewhere in the literature. In addition, given that the bank knows in advance which fraction of loans will be repaid (and plans its funding structure accordingly), macroeconomic or financial shocks in the model do not destroy the left-hand side of the balance sheet of the bank, and therefore do not deplete capital as in the well-known bank capital transmission channel of monetary policy (see Van den Heuvel (2006)). Thus, the model does not feature the standard leverage constraints channel of amplification of capital requirements studied elsewhere either. In the model, the main effect of capital requirements in the model is to disrupt the ability of the bank to change the composition of its funding sources. In the absence of capital requirements, any shock that reduces the deposit rate will incentivize the bank to switch away from bank capital into deposits, thus increasing the demand for deposits and dampening the effect of the shock on interest rates and the price of housing services. The main effect of capital requirements in the model is to disrupt the ability of the bank of switching to cheaper funding sources (deposits) after a shock. Capital requirements thus have the effect of amplifying the response of aggregate variables to shocks through the composition of the right-hand side of the balance-sheet of the bank (a channel that might be described as the bank funding composition channel).

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[1] Spain is the emblematic case of empirical research on the effects of dynamic provisioning. See Nogueira and Nakane (2015).

[2] For example, following the principles set out by the Basel Committee, regulatory capital requirements may potentially differ across credit categories due to, among others, different rates of recovery.