

# National Macroprudential Policies in the Euro Area: Flexibility vs. Supervision

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## Abstract

In this paper, I shed some light on a much discussed topic in the policy debate: Should national macroprudential policies be supervised by a supranational entity in a monetary union? To do so, I develop a two-country DSGE monetary union model, which I calibrate to the core and periphery regions of the euro area. Monetary policy is set by the ECB, while macroprudential policies, based on the loan-to-value ratio (*LTV*), are set nationally. Results show that, given that the economy in the periphery is more leveraged, macroprudential policies need to be more aggressive in that region. I also find that, when *LTV* policies are set independently in a non-coordinated manner by each authority, albeit being beneficial for both countries and for the union as a whole, welfare gains are not as high as when they are coordinated and supervised by a separate body.

Keywords: Macroprudential policies, *LTV*, monetary union, coordination, financial stability.

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# 1 Introduction

The severe crisis we have experienced in the last decade has taught us that we need policies now to prevent systemic risk and excessive credit growth, namely macroprudential policies. In the euro area, the institutional framework comprises various authorities with a macroprudential mandate at a national level, and the ECB with specific macroprudential competence at the Banking Union level. The ECB monitors developments in the banking sector of the euro area and the EU as a whole, as well as other financial sectors, to identify any vulnerabilities and check the resilience of the financial system. It carries out these tasks together with the other central banks of the Eurosystem and the European System of Central Banks. That is, macroprudential policies are implemented at a national level, but within a system of central supervision.

However, this current macroprudential framework still generates a number of doubts because of the complex process for coordinating measures across heterogeneous members. The euro area is indeed an area in which member states' business and financial cycles are not fully synchronized, especially as regards credit and housing markets. Following this debate, the European Commission launched in 2016 a consultation on the EU macroprudential framework to gather feedback and evidence on how it is functioning and how should be properly be designed. The key aim was to ensure the right balance between national flexibility and central supervision is achieved (See [http://ec.europa.eu/finance/consultations/2016/macroprudential-framework/index\\_en.htm](http://ec.europa.eu/finance/consultations/2016/macroprudential-framework/index_en.htm)).

In this paper, I explore this issue from a theoretical perspective, with a two-country monetary union DSGE model calibrated for core and periphery. In particular, I study the welfare implications of having national macroprudential policies supervised by a centralized entity that is in charge of safeguarding the welfare of the whole union. In this way, I can propose what the optimal compromise between national and centralized policies would be. For that purpose, I consider two cases; one in which policies are set by each country independently, in a non-coordinated manner; and one in which there is a supranational authority that coordinates the policies and acts in favor of the whole union.

Results show that macroprudential policy should be more aggressive in the periphery, given its more leveraged economy, supporting the use of national macroprudential policies. However, welfare increases by more if policies are supervised and coordinated by a supranational authority, which acts in favor of having the ECB as a coordinating entity.

## 2 Model Setup

The model constitutes a two-country monetary union version of the seminal paper of Iacoviello (2005), introducing cross-country housing-market heterogeneity in the spirit of Rubio (2014). The home country represents the core economy and the rest of the union is the periphery. Variables in the periphery are denoted by a star. Households consume, work, and demand real estate. Each country produces one differentiated intermediate good, but households consume goods from both countries. There are two types of consumers in each country: borrowers and savers. Borrowers are constrained individuals who need to collateralize their debt repayment with housing. Firms follow a standard Calvo problem. There is a construction sector that produces houses. Monetary policy is conducted by a single central bank that responds to a weighted average of inflation in both countries. A separate authority conducts macroprudential policy. I allow for housing-market heterogeneity across the countries.

I summarize the consumer's problem below. Here, only the problems and the equations for the core economy are presented and discussed, since the model is symmetric. The complete set of structural equations is presented in the Appendix.

### 2.1 The Consumer's Problem

#### 2.1.1 Savers

Savers in the core economy maximize as follows:

$$\max E_0 \sum_{t=0}^{\infty} \beta^t \left( \ln \tilde{C}_t + j \ln H_t - \frac{(L_t^u)^\eta}{\eta} \right), \quad (1)$$

$E_0$  is the expectation operator,  $\beta \in (0, 1)$  is the discount factor, and  $\tilde{C}_t$ ,  $H_t$ , and  $L_t$  are consumption at  $t$ , the stock of housing, and hours worked, respectively.  $j$  represents the weight of housing in the utility function.  $1/(\eta - 1)$  is the aggregate labor-supply elasticity.

Consumption is a bundle of domestically and foreign-produced goods, defined as:  $\tilde{C}_t = (C_t)^n (C_t^*)^{1-n}$ , where  $n$  is the size of the core economy. Savers provide labor to both the consumption and construction sector, so that  $L_t = \left[ (L_{ct})^{1-\nu} + (L_{ht})^{1-\nu} \right]^{\frac{1}{1-\nu}}$ .

The budget constraint is as follows:

$$\begin{aligned}
P_t C_t + P_t^* C_t^* + Q_t (H_t - H_{t-1}) + R_{t-1} B_{t-1} + R_{t-1}^* D_{t-1} + \frac{\psi}{2} D_t^2 \leq \\
W_{ct} L_{ct} + W_{ht} L_{ht} + B_t + D_t + P_t F_t + P_t T_t,
\end{aligned} \tag{2}$$

where  $P_t$  and  $P_t^*$  are the prices of the goods produced in the home country and abroad, respectively,  $Q_t$  is the housing price, and  $W_{ct}$  and  $W_{ht}$  are the consumption and housing sector wages for unconstrained consumers.  $B_t$  represents domestic bonds denominated in the common currency.  $R_t$  is the nominal interest rate in the home economy. Positive bond holdings signify borrowing, and negative signify savings. However, as we will see, unconstrained consumers will choose not to borrow at all: they are the savers in this economy.  $D_t$  are foreign-bond holdings by savers at home.<sup>1</sup>  $R_t^*$  is the nominal rate of foreign bonds, which are denominated in euros. As is common in the literature, to ensure stationarity of net foreign assets we introduced a small quadratic cost of deviating from zero foreign borrowing,  $\frac{\psi}{2} D_t^2$ .<sup>2</sup> Savers obtain interest on their savings.  $F_t$  are lump-sum profits received from the firms.  $T_t$  are lump-sum government transfers.

Dividing by  $P_t$ , we can rewrite the budget constraint in terms of goods at home. Maximizing (1) subject to the budget constraint, we obtain the first-order conditions for the savers.

### 2.1.2 Borrowers

Borrowers are more impatient than savers, that is  $\tilde{\beta} < \beta$ . They face a collateral constraint: the expected debt repayment in the next period cannot exceed a proportion of the expectation of tomorrow's value of today's stock of housing:

$$E_t \frac{R_t}{\pi_{t+1}} b'_t \leq k_t E_t q_{t+1} H'_t, \tag{3}$$

$k_t$  can be interpreted as the loan-to-value ratio and it is the instrument for the national macroprudential regulator.

Borrowers maximize their lifetime utility function:

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<sup>1</sup>Savers have access to international financial markets.

<sup>2</sup>See Iacoviello and Smets (2006) for a similar specification of the budget constraint.

$$\max E_0 \sum_{t=0}^{\infty} \tilde{\beta}^t \left( \ln \tilde{C}'_t + j_t \ln H'_t - \frac{(L'_t)^\eta}{\eta} \right), \quad (4)$$

where  $\tilde{C}'_t = (C'_t)^n (C_t^{*'})^{1-n}$ ,  $L'_t = \left[ (L'_{ct})^{1-\nu} + (L'_{ht})^{1-\nu} \right]^{\frac{1}{1-\nu}}$ , subject to the budget constraint (in terms of the consumption good):

$$C'_t + \frac{P_t^*}{P_t} C_t^{*'} + q_t (H'_t - H'_{t-1}) + \frac{R_{t-1} b'_{t-1}}{\pi_t} \leq w'_{ct} L'_{ct} + w'_{ht} L'_t + b'_t, \quad (5)$$

and subject to the collateral constraint (3).

## 2.2 Macprudential Policy

As an approximation for a realistic macroprudential policy, I consider a Taylor-type rule for the loan-to-value ratio (LTV), which responds to credit deviations from its steady state.<sup>3</sup> Macroprudential policy is national, that is, each country can implement its own rule:

$$k_t = k_{SS} \left( \frac{b_t}{b} \right)^{-\phi_b}, \quad (6)$$

$$k_t^* = k_{SS}^* \left( \frac{b_t^*}{b^*} \right)^{-\phi_b^*}. \quad (7)$$

## 2.3 Parameter Values

Parameters are calibrated to reflect the core economy and the periphery. Some of the parameters are standard and are common for both economies and some others will be specifically calibrated for each area.

Discount factors are set to be common in both economies, following the standard values in the literature. The discount factor for savers,  $\beta$ , is set to 0.99 so that the annual interest rate is 4% in steady state. The discount factor for borrowers,  $\tilde{\beta}$ , is set to 0.98.<sup>4</sup> The steady-state weight of housing in the utility function,  $j$ , is set to 0.12. This parameter pins down the ratio of housing wealth to GDP.<sup>5</sup> I set  $\eta = 2$ , implying a value of the labor supply elasticity of 1.<sup>6</sup> Following Horvath (2000) and

<sup>3</sup>I call it "Taylor type" because its structure reminds that of the traditional Taylor rule for monetary policy.

<sup>4</sup>Lawrance (1991) estimate discount factors for poor consumers at between 0.95 and 0.98 at quarterly frequency.

<sup>5</sup>Following Aspachs and Rabanal (2010), I use 1.40, value that reflects the ratio of housing wealth to GDP across most industrialized countries as a proxy for the euro area.

<sup>6</sup>Microeconomic estimates usually suggest values in the range of 0 and 0.5 (for males). Domeij and Flodén (2006) show

Iacoviello and Neri (2010), I set the inverse elasticity of substitution across hours in the two sectors to 1. For the loan-to-value ratio I consider a steady-state value of 0.70 and 0.80, for the core and the periphery, respectively, in order to reflect a low and a high leveraged country.<sup>7</sup> The labor-income share of unconstrained consumers,  $\gamma$ , is set to 0.7.<sup>8</sup> I pick a value of 6 for  $\varepsilon$ , the elasticity of substitution among intermediate goods. This value implies a steady-state markup of 1.2. The probability of not changing prices,  $\theta$ , is set to 0.75, implying that prices change every four quarters on average. For the Taylor rule parameters, I use  $\rho = 0.8$ ,  $\phi_\pi = 0.5$ . The first value reflects a realistic degree of interest-rate smoothing.<sup>9</sup>  $\phi_\pi$  is consistent with the original parameters proposed by Taylor in 1993. The size of the peripheral group is considered to be 40%.<sup>10</sup> A technology shock is a 1% positive technology with 0.9 persistence.<sup>11</sup>

### 3 Optimal Macroprudential Policy

For the optimal macroprudential policy calculation, I study two polar cases; the first one corresponds to two independent national policies, which are not coordinated and which do not take into account union welfare, just national welfare; the second one considers a coordinated case in which a supranational authority decides the national policy, favoring the whole union. Monetary policy is taken as given in all cases.<sup>12</sup>

When national policies are designed independently and without taking into account the union welfare, I consider a non-coordinated game between the two countries in which the Nash equilibrium would determine the solution. However, when they are supervised by the ECB, national authorities are forced to simultaneously take into account union welfare when optimizing their policies.

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that in the presence of borrowing constraints this estimate could have a downward bias of 50%.

<sup>7</sup>These values approximately reflect the prevalent loan-to-values in Germany and Spain, representing respectively the core and the periphery. Their residential debt-to-income ratio also reflects the different level of leverage in these countries, 42.4 and 55.4 in 2014, respectively (CESifo).

<sup>8</sup>This value is in the range of the estimates of Iacoviello (2005) and Iacoviello and Neri (2010) for the US, and Campbell and Mankiw (1991) for the US, Canada, France, and Sweden. Therefore, I take it as valid for most of the countries of the euro area.

<sup>9</sup>See McCallum (2001).

<sup>10</sup>I follow Quint and Rabanal (2014).

<sup>11</sup>This high persistence value for technology shocks is consistent with what is commonly reported in the literature. Smets and Wouters (2003) estimated a value of 0.822 for this parameter in Europe; Iacoviello and Neri (2010) estimated it as 0.93 for the US.

<sup>12</sup>I solve the model using a second-order approximation of the structural equations, for given policy and for common technology shocks, and then evaluate welfare using this solution. As in Mendicino and Pescatori (2007), I take this latter approach to be able to evaluate the welfare of the two types of agents separately and then I aggregate across agents and countries.

**Table 1: Optimal Macroprudential Policy**

National Policies	Independent				Supervised				
	$\phi_b$	$\sigma_b$	$\sigma_y$	$\sigma_\pi$	$\phi_b$	$\sigma_b$	$\sigma_y$	$\sigma_\pi$	Welf Gain
<b>CORE</b>	0.4	1.315	1.931	0.263	0.6	1.052	1.929	0.265	0.0045
<b>PERIPHERY</b>	0.5	1.249	1.920	0.262	0.7	1.008	1.918	0.263	0.0032
<b>UNION</b>	-	1.288	1.926	0.263	-	1.034	1.924	0.264	0.0040

Table 1 presents results from the optimization problem, considering the two cases mentioned above; independent versus supervised national macroprudential policies. I display the optimized parameters in the macroprudential rules for both cases and the volatilities of macroeconomic and financial variables, measured by the standard deviation of borrowing, output and inflation. I also calculate the welfare gain derived from having a supervised macroprudential policy as opposed to a non coordinated one.<sup>13</sup>

Results show that macroprudential policies need to be more aggressive in the periphery. This is a consequence of a more leveraged economy in this region that makes it more volatile under technology shocks. However, when national policies are coordinated and supervised by a supranational authority, which ensures that union welfare is maximized, macroprudential policies in both countries need to respond more strongly to financial developments. Nevertheless, it is still the case that the periphery has a higher coefficient in the macroprudential rule. We can see that having a supervised macroprudential policy is Pareto improving, according to the last column in Table 1. We observe that, with respect to the independent situation, both countries and the whole union have a welfare improvement. In terms of volatilities, financial markets are more stable in the supervised case, contributing to the welfare gain. In terms of macroeconomic volatilities, output is more stable in the supervised case, at the expense of a slightly higher inflation volatility. A stronger macroprudential policy seems to interfere with the ECB monetary policy and this is why it is less effective in stabilizing inflation.

## 4 Concluding Remarks

In this paper, I build a two-country, two-sector DSGE model with housing and collateral constraints in order to illustrate how national macroprudential policies should be set in the euro area. I consider two countries within a monetary union; core and periphery. These two countries differ in their housing markets. In terms of national macroprudential policies, I consider that the LTV can be set at a national

<sup>13</sup>Welfare gains are presented in consumption equivalent units.

level. However, I study two cases, one in which national macroprudential policies are set independently, in a non-coordinated game, and one in which there is a supranational authority supervising the setting of these policies.

Results show that the LTV rule needs to be more aggressive in the periphery, both in the independent and supervised case. However, coordinating policies calls for a stronger response of the LTV in both regions, and it delivers an unambiguous welfare improvement with respect to independently setting them. The welfare gain is coming from more stable financial markets and less volatile output, however, it comes at the expense of a slightly higher inflation volatility, because macroprudential policies interfere with the ECB monetary policy.

## Appendix

Here, I present the equations describing the core economy. Similar equations hold for the periphery

### Savers

$$\frac{C_t}{C_t^*} = \frac{nP_t^*}{(1-n)P_t} \quad (\text{A1})$$

$$R_t = \frac{R_t^*}{(1-\psi d_t)} \quad (\text{A2})$$

$$\frac{j}{H_t} = \frac{n}{C_t} q_t - \beta E_t \frac{n}{C_{t+1}} q_{t+1} \quad (\text{A3})$$

$$w_{ct} = (L_t)^{\eta-1} (L_{ct})^{-\nu} \left[ (L_{ct})^{1-\nu} + (L_{ht})^{1-\nu} \right]^{\frac{\nu}{1-\nu}} \frac{C_t}{n} \quad (\text{A4})$$

$$w_{ht} = (L_t)^{\eta-1} (L_{ht})^{-\nu} \left[ (L_{ct})^{1-\nu} + (L_{ht})^{1-\nu} \right]^{\frac{\nu}{1-\nu}} \frac{C_t}{n} \quad (\text{A5})$$

### Borrowers

$$\frac{C'_t}{C_t^{*'}} = \frac{nP_t^*}{(1-n)P_t} \quad (\text{A6})$$

$$\frac{n}{C'_t} = \tilde{\beta} E_t \left( \frac{nR_t}{\pi_{t+1} C'_{t+1}} \right) + \lambda_t R_t \quad (\text{A7})$$



$$\frac{j}{H'_t} = \frac{n}{C'_t} q_t - \tilde{\beta} E_t \frac{n}{C'_{t+1}} q_{t+1} - \lambda_t k_t E_t q_{t+1} \pi_{t+1} \quad (\text{A8})$$

$$w'_{ct} = (L'_t)^{\eta-1} (L'_{ct})^{-\nu} \left[ (L'_{ct})^{1-\nu} + (L'_{ht})^{1-\nu} \right]^{\frac{\nu}{1-\nu}} \frac{C'_t}{n} \quad (\text{A9})$$

$$w'_{ht} = (L'_t)^{\eta-1} (L'_{ht})^{-\nu} \left[ (L'_{ct})^{1-\nu} + (L'_{ht})^{1-\nu} \right]^{\frac{\nu}{1-\nu}} \frac{C'_t}{n} \quad (\text{A10})$$

## Firms

$$Y_t = A_t (L_{ct})^\gamma (L'_{ct})^{(1-\gamma)} \quad (\text{A11})$$

$$I_t = A_t (L_{ht})^\gamma (L'_{ht})^{(1-\gamma)} \quad (\text{A12})$$

$$w_{ct} = \frac{1}{X_t} \gamma \frac{Y_t}{L_{ct}} \quad (\text{A13})$$

$$w'_{ct} = \frac{1}{X_t} (1-\gamma) \frac{Y_t}{L'_{ct}} \quad (\text{A14})$$

$$w_{ht} = \gamma \frac{q_t I_t}{L_{ht}} \quad (\text{A15})$$

$$w'_{ht} = (1-\gamma) \frac{q_t I_t}{L'_{ht}} \quad (\text{A16})$$

## Monetary Policy

$$R_t = (R_{t-1})^{\rho_R} \left( \left[ (\pi_t)^n (\pi_t^*)^{(1-n)} \right]^{(1+\phi_\pi)} R \right)^{1-\rho_R} \varepsilon_{R,t}, \quad (\text{A17})$$

where  $Y_t$ ,  $I_t$  and  $\pi_t$  represent output, housing investment and inflation, respectively.  $\lambda_t$  is the Lagrange multiplier on the collateral constraint.  $X_t$  is the markup.  $A_t$  and  $\varepsilon_{R,t}$  are technology and monetary policy shocks, respectively.

<b>Table A1: Parameter Values</b>		
$\beta$	0.99	Discount Factor for Savers
$\tilde{\beta}$	0.98	Discount Factor for Borrowers
$j$	0.12	Weight of Housing in Utility Function
$\eta$	2	Parameter associated with labor elasticity
$k$	0.7/0.8	Loan-to-value, core/periphery
$\gamma$	0.70	Labor-Income share for savers
$\varepsilon$	6	Elasticity of substitution among intermediate goods
$1 - \nu$	2	Labor elasticity of substitution across sectors
$n$	0.6	Core country Size
$\rho^R$	0.8	Interest-rate smoothing in Taylor rule
$\phi_\pi$	0.5	Inflation Parameter in Taylor rule

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