BBVA Research

Macroeconomic Effects of Taxes on Banking

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Creating Opportunities

Introduction

- This paper evaluates the macroeconomic effects of taxes on banking in a small open economy in a currency union for three different alternatives: an additional tax on profits, on deposits and on loans.
- We propose a DSGE model with a rich detail of taxes and a banking sector, and show that these three taxes are equivalent in their effects on macroeconomic variables.
- Banks react to higher taxes by increasing their profits before taxes and by translating part of the fiscal cost to households and firms through higher interest rates on loans.
- The increase in government revenues comes at a cost of a long-run decrease of GDP, an increase in loans interest rates, and a reduction in the level of credit, deposits and bank capital.
- Our simulation exercises show that the trade-off between government revenues and economic activity is well captured by a fiscal multiplier of GDP to *ex post* government revenue close to -0.9, which is virtually independent of the tax rate.

Previous literature

- Banking taxes on profits increase loan interest rates by increasing capital costs (Capelle-Blancard and Havrylchyk, 2017, Caminal, 2003, and Albertazzi and Gambacorta, 2010)
  - Demirgüç-Kunt and Huizinga (1999 and 2001) find that taxes on profits are fully passed on to the consumer. Banerji et al. (2017): the tax imposed in 2000 on gross profits of large Japanese banks operating in Tokyo increase interest rates and reduce loans
  - Capelle-Blancard and Havrylchyk (2017) show that results depends on how potential endogeneity problems are addressed
- Kogler (2016) Uses a sample of 2,987 banks in 23 EU countries from 2007 to 2013, and finds that European banks have increased interest rates on loans between 20 and 24 basis points after the introduction of different bank taxes
- Buch, Hilberg and Tonzer (2016): German banks affected by the tax on liabilities net of own resources and retail deposits respond with lower growth of loans and higher interest rates on new deposits. These results have been corroborated by Haskamp (2018)
- Similar results obtained by Capelle-Blancard and Havrylchyk (2017) for the tax introduced in the Hungarian banking system in 2010
- The analysis of the effects of taxes on banking activity is abundant, but on aggregate activity is scarce. Lendvai, Raciborski and Vogel (2013) study the impact of an equity transaction tax on financial and real variables in a DSGE model with financial frictions but without a banking sector

The model

- The model represents a small open economy that belongs to a trade and monetary union (EMU)
- The economy trades with the rest of the world consumption and investment goods as well as international nominal bonds
- Four types of households: patient, impatient, hand-to-mouth and entrepreneurs:
  - The patient (impatient) households consume, save (borrow), supply labor, and accumulate housing services
  - The hand-to-mouth households consume, supply labor and have no access to deposits or loans.
  - Households' labour is sold by labor unions to intermediate good producers
  - Entrepreneurs purchase capital and rent it to intermediate good producers, consume and borrow

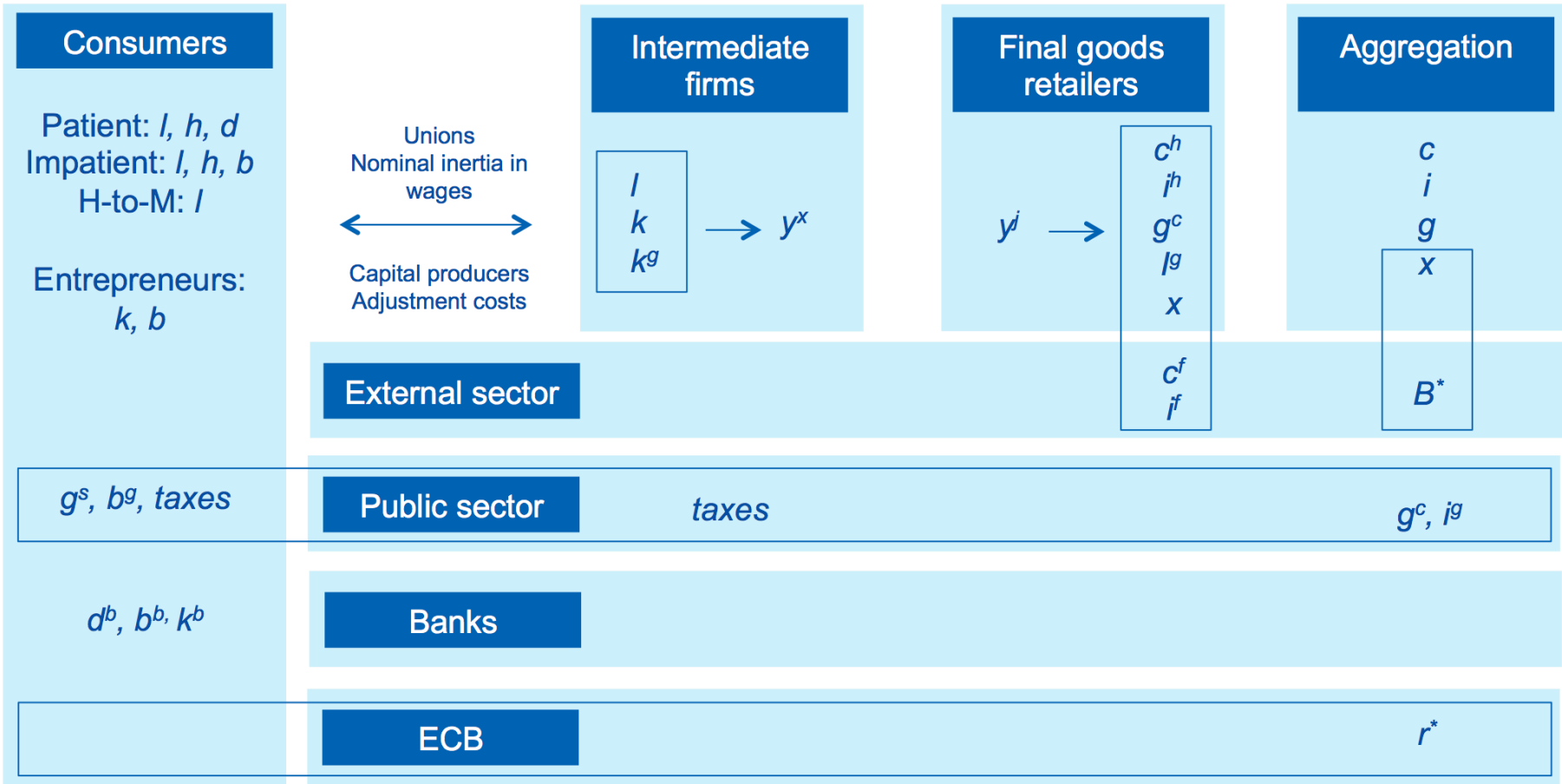
The model

- Intermediate good producers hire labor and rent capital from entrepreneurs to produce intermediate goods that are sold to good retailers in competitive markets
- Retailers buy intermediate goods and sell monopolistically final goods to consumers and capital producers
- Banks form holding units composed by a wholesale bank, a loan-retailing bank, and a deposit-retailing bank
- Patient households deposit their savings on deposit-retailing banks
- Impatient households and entrepreneurs take loans on loan-retailing banks
- Deposit-retailing and loan-retailing banks operates in monopolistically competitive markets

The model

- To ensure stationarity of equilibrium, banks pay a risk-premium that increases with the country's net foreign asset position, as in Schmitt-Grohe and Uribe (2003)
- Fiscal authority provides public consumption goods, invests, borrows, and sets lump-sum transfers and distortionary taxes on consumption, housing services, labor earnings, capital earnings, and financial operations (bond and deposit changes).
- Fiscal authority reacts by rising lump-sum taxes to deviations of the ratio of debt over GDP with respect to its objective.
- A supra-national monetary authority (ECB) sets the interest rate using a Taylor rule.

Model structure



Patient households

- Maximize utility

$$E_0 \sum_{t=0}^{+\infty} \beta_p^t \left[(1 - a_{cp}) \varepsilon_t^z log(c_{j,t}^p - a_{cp} c_{t-1}^p) + a_{hp} \varepsilon_t^h log(h_{j,t}^p) - \frac{a_{\ell p} \ell_{j,t}^{p\,1+\phi}}{1+\phi} \right],$$

subject to the following budget constraint:

$$(1+\tau_t^c) c_{j,t}^p + (1+\tau_t^h) q_t^h \Delta h_{j,t}^p + d_{j,t}^p + \frac{\alpha_{RW}(1-\alpha_{B_g}) Bg_t}{\gamma_p} - \frac{(1-\alpha_{ED}) B_t^*}{\gamma_p} =$$
$$(1-\tau_t^w) w_{j,t}^p \ell_{j,t}^p + \frac{1+r_{t-1}^d}{\pi_t} d_{j,t-1}^p + \frac{(1-\omega_b)(1-\tau_t^{Jb})}{\gamma_p} J_{t-1}^b - \frac{T_t^{up}}{\gamma_p} -$$
$$\frac{T_t^g}{\gamma_p+\gamma_i+\gamma_e+\gamma_m} + \frac{\alpha_{RW}(1-\alpha_{B_g})(1+r_t^d) Bg_{t-1}}{\gamma_p} - \frac{(1-\alpha_{ED})(1+r_t^d) B_{t-1}^*}{\gamma_p}$$

where τ_t^{Jb} denotes taxes banks' dividends

Impatient households

- They have debts instead of wealth, and maximize utility

$$E_0 \sum_{t=0}^{+\infty} \beta_i^t \left[(1 - a_{ci}) \varepsilon_t^z log(c_{j,t}^i - a_{ci} c_{t-1}^i) + a_{hi} \varepsilon_t^h log(h_{j,t}^i) - \frac{a_{\ell i} \ell_{j,t}^{i\,1+\phi}}{1+\phi} \right]$$

subject to:

$$(1+\tau_t^c) c_{j,t}^i + (1+\tau_t^h) q_t^h \Delta h_{j,t}^i + \left(\frac{1+r_{t-1}^{bi}}{\pi_t} \right) b_{j,t-1}^i =$$
$$(1-\tau_t^w) w_{j,t}^i \ell_{j,t}^i + b_{j,t}^i - \frac{T_t^{ui}}{\gamma_i} - \frac{T_t^g}{\gamma_p+\gamma_i+\gamma_e+\gamma_m}$$

$$(1+r_t^{bi}) b_{j,t}^i \leq m_t^i E_t \left\{ q_{t+1}^h h_{j,t}^i \pi_{t+1} \right\},$$

Hand-to-mouth households

- They have neither debt nor wealth, and maximize utility

$$E_0 \sum_{t=0}^{+\infty} \beta_m^t \left[(1 - a_{cm}) \varepsilon_t^z log(c_{j,t}^m - a_{cm} c_{t-1}^m) - \frac{a_{\ell m} {\ell m}_{j,t}^{1+\phi}}{1+\phi} \right].$$

subject to

$$(1 + \tau_t^c) c_{j,t}^m = (1 - \tau_t^w) w_{j,t}^m \ell_{j,t}^m - \frac{T_t^{um}}{\gamma_m} - \frac{T_t^g}{\gamma_p + \gamma_i + \gamma_e + \gamma_m}$$

Entrepreneurs

- Maximize the following lifetime utility function

$$E_0 \sum_{t=0}^{+\infty} \beta_e^t (1 - a_e) log(c_{j,t}^e - a_e c_{t-1}^e).$$

subject to

$$(1 + \tau_t^c) c_{j,t}^e + \left(\frac{1 + r_{t-1}^{be}}{\pi_t} \right) b_{j,t-1}^e + q_t^k k_{j,t}^e =$$
$$(1 - \tau_t^k) r_t^k k_{j,t}^e + q_t^k (1 - \delta) k_{j,t-1}^e + b_{j,t}^e + \frac{J_t^x}{\gamma_e} + \frac{J_t^k}{\gamma_e} - \frac{T_t^g}{\gamma_p + \gamma_i + \gamma_e + \gamma_m}$$
$$(1 + r_t^{be}) b_{j,t}^e \leq m_t^e E_t \left\{ q_{t+1}^k \pi_{t+1} (1 - \delta) k_{j,t}^e \right\},$$

Unions

- Unions maximize the households' utility perceived from the wage income, net of a quadratic cost for adjusting the nominal wage and the labour supply desutility:

$$E_0 \sum_{t=0}^{+\infty} \beta_s^t \left\{ U_{c,j,t}^s \theta_t^{wc} \left[w_{j,t}^s \ell_{j,t}^s - \frac{\eta_w}{2} \left(\pi_{j,t}^{ws} \theta_t^w - \pi_{t-1}^{\iota_w} \pi^{1-\iota_w} \theta_{t-1}^c \right)^2 w_t^s \right] - \frac{a_{\ell s} \ell_{j,t}^{s\,1+\phi}}{1+\phi} \right\}$$

subject to

$$\ell_{j,t}^s = \left(\frac{w_{j,t}^s}{w_t^s} \right)^{-\varepsilon_t^\ell} \ell_t^s$$

Intermediate good producers

- Production function

$$y_{j,t}^{x} = A_t \left(k_{j,t-1}^{ee} u_{j,t}\right)^{\alpha} \left[\left(\ell_{j,t}^{pp}\right)^{\mu_p} \left(\ell_{j,t}^{ii}\right)^{\mu_i} \left(\ell_{j,t}^{mm}\right)^{\mu_m}\right]^{1-\alpha} \left(\frac{K_{t-1}^{g}}{\gamma_x}\right)^{\alpha_g},$$

  where A_t denotes an aggregate TFP productivity shock.

Capital producers

- Each capital producer chooses $k_{j,t}$ and $i_{j,t}$ to maximize:

$$E_0 \sum_{t=0}^{+\infty} \beta_e^t \lambda_t^e \left\{ q_t^k [k_{j,t} - (1-\delta) k_{j,t-1}] - p_t^I i_{j,t} - \Phi_k \right\}$$

  subject to quadratic adjustment costs in investment (as Bernanke, Gertler and Gilchrist, 1999).

Home goods retailers

- They operate in a monopolistically competitive market and maximize:

$$E_0 \sum_{t=0}^{+\infty} \beta_p^t \lambda_{j,t}^p \left[p_t^H \frac{P_{j,t}^H y_{j,t}}{P_t^H} - \frac{y_{j,t}^{xx}}{x_t} - \frac{\eta_p}{2} \left(\frac{P_{j,t}^H}{P_{j,t-1}^H} - \left(\pi_{t-1}^H\right)^{\iota_p} \left(\pi_{ss}^H\right)^{1-\iota_p} \right)^2 y_t \right]$$

subject to

$$y_{j,t} = y_{j,t}^{xx}$$

$$y_{j,t} = \left(\frac{P_{j,t}^H}{P_t^H} \right)^{-\varepsilon_t^y} Y_t$$

Banks

- As in Gerali et al (2010), each bank branch is composed of three units: a wholesale unit and two retail branches
- The two retail branches are assumed to operate in monopolistically competitive markets
- Each unit of deposits and loan bought by households and entrepreneurs are a CES basket of slightly differentiated products supplied by each retail branch j
- The wholesale unit manages the capital position of the bank, receives loans from abroad, and raises wholesale domestic loans and deposits. The loan-retailing unit also gives loans to the government in a competitive market

Whosale banks

- They choose the amount of wholesale loans, $b^b_{j,t}$, wholesale deposits, $d^b_{j,t}$, and foreign borrowing ($-\frac{B^*_t}{\gamma_b}$) to maximize

$$\max_{b^b_{j,t}, d^b_{j,t}, B^*_t} r^b_t b^b_{j,t} - r_t d^b_{j,t} + r^*_t \frac{B^*_t}{\gamma_b} - \frac{\eta_b}{2}\left(\frac{k^b_{j,t}}{b^b_{j,t}} - \nu_b\right)^2 k^b_{j,t}$$

where

$$k^b_{j,t} = \frac{(1-\delta_b)}{\varepsilon^{kb}_t} k^b_{j,t-1} + (1-\tau^{Jb}_t)\omega_b J^b_{j,t-1},$$

The balance sheet of the wholesale banks is:

$$b^b_{j,t} = d^b_{j,t} - \frac{B^*_{j,t}}{\gamma_b} + k^b_{j,t}.$$

Banks profits

The profit of the bank branch j in terms of consumption good units is given by:

$$
\begin{aligned}
J_t^b = {} & (r_t^{bi} - \tau_t^B) b_t^{ii} + (r_t^{be} - \tau_t^B) b_t^{ee} - (r_t^d + \tau_t^D) d_t^{pp} + r_t^* \frac{B_t^*}{\gamma_b} \\
- {} & \frac{\eta_b}{2} \left(\frac{k_t^b}{b_t^b} - \nu_b \right)^2 k_t^b - \frac{\eta_d}{2} \left(\frac{r_t^d}{r_{t-1}^d} - 1 \right)^2 (r_t^d + \tau_t^D) d_t \\
- {} & \frac{\eta_{bi}}{2} \left(\frac{r_t^{bi}}{r_{t-1}^{bi}} - 1 \right)^2 (r_t^{bi} - \tau_t^B) b_t^{ii} \\
- {} & \frac{\eta_{be}}{2} \left(\frac{r_t^{be}}{r_{t-1}^{be}} - 1 \right)^2 (r_t^{be} - \tau_t^B) b_t^{ee},
\end{aligned}
$$

where τ^{Jb} is the tax rate on banks' profits; τ^D is the tax rate on deposits from households; and τ^B is the tax rate on loans to mortgagors and entrepreneurs.

Deposit-retailing branch

- It passes the raised deposits to the wholesale branch (which pay the rate r_t) and chooses the path of the nominal gross interest rate paid by deposits, $r^d_{j,t}$, to households to maximize:

$$E_0 \sum_{t=0}^{+\infty} \beta_p^t \lambda_t^p \left[r_t d^b_{j,t} - r^d_{j,t} d^{pp}_{j,t} - \frac{\eta_p}{2} \left(\frac{r^d_{j,t}}{r^d_{j,t-1}} - 1 \right)^2 r^d_t d^{pp}_t \right]$$

subject to

$$d^b_{j,t} = d^{pp}_{j,t}$$

$$d^{pp}_{j,t} = \left(\frac{r^d_{j,t}}{r^d_t} \right)^{-\varepsilon^d_t} d^{pp}_t,$$

where $\varepsilon^d_t \equiv \left(\frac{\theta^d_t}{\theta^d_t - 1} \right)$

Loan-retailing branch

- The branch chooses $r^{bi}_{j,t}$ and $r^{be}_{j,t}$ to maximize:

$$E_0 \sum_{t=0}^{+\infty} \beta_p^t \lambda_t^p \left[\begin{array}{c} r^{bi}_{j,t} b^{ii}_{j,t} + r^{be}_{j,t} b^{ee}_{j,t} + \theta^g_{ss} r^b_t \left(\frac{B^g_t}{\gamma_b} \right) - r^b_t b^b_{j,t} - \frac{\eta_i}{2} \left(\frac{r^{bi}_{j,t}}{r^{bi}_{j,t-1}} - 1 \right)^2 r^{bi}_t b^{ii}_t \\ - \frac{\eta_e}{2} \left(\frac{r^{be}_{j,t}}{r^{be}_{j,t-1}} - 1 \right)^2 r^{be}_t b^{ee}_t \end{array} \right]$$

subject to

$$b^b_{j,t} = b^{ii}_{j,t} + b^{ee}_{j,t} + \frac{B^g_t}{\gamma_b},$$

$$b^{ii}_{j,t} = \left(\frac{r^{bi}_{j,t}}{r^{bi}_t} \right)^{-\varepsilon^{bi}_t} b^{ii}_t,$$

$$b^{ee}_{j,t} = \left(\frac{r^{be}_{j,t}}{r^{be}_t} \right)^{-\varepsilon^{be}_t} b^{ee}_t.$$

where $\varepsilon^{bs}_t \equiv \left(\frac{\theta^{bs}_t}{\theta^{bs}_t - 1} \right)$

External sector

- Imports:

$$c_t^h = (1-\omega_c)\left(p_t^H\right)^{-\sigma_c} c_t^c$$

$$c_t^f = \omega_c\left(p_t^M\right)^{-\sigma_c} c_t^c$$

$$i_t^h = (1-\omega_i)\left(\frac{p_t^H}{p_t^I}\right)^{-\sigma_i} i_t^z$$

$$i_t^f = \omega_i\left(\frac{p_t^M}{p_t^I}\right)^{-\sigma_i} i_t^z$$

External sector

- Exports demand

$$ex_t = \omega_c^* \left((1 - \tau_t^x) \left(\frac{p_t^H}{er_t} \right)^{(1-ptm)} \right)^{-\sigma_c^*} (c_t^* + i_t^*)$$

With full pricing to market ($ptm = 0$), $p_t^{EX} = (1 - \tau_t^x) p_t^H$ then

$$ex_t = \omega_c^* \left((1 - \tau_t^x) \left(\frac{p_t^H}{er_t} \right) \right)^{-\sigma_c^*} (c_t^* + i_t^*)$$

If the law of one price holds then $ptm = 1$, $p_t^{EX} = (1 - \tau_t^x) er_t$ and

$$ex_t = \omega_c^* (1 - \tau_t^x)^{-\sigma_c^*} (c_t^* + i_t^*)$$

External sector

- Net foreing asset position B_t^*

$$B_t^* = \frac{\left(1 + r_{t-1}^*\right)}{\pi_t} B_{t-1}^* + \left[p_t^{EX} \gamma^* ex_t - p_t^M \left(\gamma_c c_t^f + \gamma_z i_t^f \right) \right]$$

- Trade balance TB_t is defined as

$$TB_t = p_t^{EX} \gamma^* ex_t - p_t^M \left(\gamma_c c_t^f + \gamma_z i_t^f \right)$$

Monetary policy

- Taylor rule for the ECB

$$(1+r_t) = (1+r_{ss})^{(1-\phi_r)}(1+r^*_{t-1})^{\phi_r}\left(\frac{\pi^{emu}_t}{\pi^{emu}_{ss}}\right)^{\phi_\pi(1-\phi_r)}\left(\frac{y^{emu}_t}{y^{emu}_{t-1}}\right)^{\phi_y(1-\phi_r)}(1+e^r_t)$$

- The domestic interest rate is given by

$$r^*_t = \phi_r r_t$$

where

$$\phi_t = \exp\left(-\widetilde{\phi}\left(\frac{B^*_t}{Y_t} - b^*\right)\theta^{rp}_t\right)$$

Fiscal policy rules

- Budget constraint

$$\begin{aligned} & C_t^g + I_t^g + \left(\frac{1+\theta_{ss}^b r_{t-1}^b}{\pi_t}\right) B_{t-1}^g = B_t^g + T_t^g + \tau_t^c \left[\gamma_p c_t^p + \gamma_i c_t^i + \gamma_e c_t^e + \gamma_m c_t^m\right] \\ + \quad & \frac{\tau_t^m}{1+\tau_t^m} p_t^M IM_t - \frac{\tau_t^x}{1-\tau_t^x} p_t^{EX} EX_t \\ + \quad & \tau_t^h q_t^h \left[\gamma_p \Delta h_t^p + \gamma_i \Delta h_t^i\right] + \tau_t^w \left[w_t^p \gamma_p \ell_t^p + w_t^i \gamma_i \ell_t^i + w_t^m \gamma_m \ell_t^m\right] + \tau_t^k r_t^k K_t \\ + \quad & \tau_t^{Jb} J_{t-1}^b + \tau_t^D d_t^p + \tau_t^B (b_t^i + b_t^e). \end{aligned}$$

- Tax rates are constant $\tau_t^s = \tau^s$ for $s = c, h, w, D, B, Jb, k, m, x$,
- Fiscal rule in lump-sum transfers

$$\frac{T_t^g}{\gamma y_{ss}} = \frac{T_{t-1}^g}{\gamma y_{ss}} + \rho_{tgb1}\left(\frac{B_t^g}{\gamma y_t} - \frac{B^{*g}}{\gamma y_t}\right) + \rho_{tgb2}\left(\frac{B_t^g}{\gamma y_t} - \frac{B_{t-1}^g}{\gamma y_t}\right)$$

- Public capital

$$K_t^g = (1-\delta_g) K_{t-1}^g + I_t^g.$$

Quantitative results

- The model has been calibrated for the Spanish economy following Boscá et al (2018)
- We solve numerically the model by changing, alternately, the tax rates on banking activity: τ^{Jb}; τ^{D}; and τ^{B}
- In all three cases, we depart from a situation in which the tax rates do not exist and then are introduced so that the *ex-ante* government revenues (i.e., the increase in revenues before the endogenous reaction in economic activity takes place) would increase by 0.1 percent points GDP
- We assume that the introduction of taxes are unanticipated and permanent, that is, there is no time for the agents to react in advance, and no specific date is proposed for tax expiration
- We also consider that any additional government revenue coming from the new tax is used to finance a lump sum transfer, which is the same for all households in the economy

Quantitative results

Macroeconomic Effects of Taxes on Banking

	Profits		Deposits		Loans	
	SS	2 years	SS	2 years	SS	2 years
GDP	-0.083	-0.031	-0.078	-0.027	-0.077	-0.027
Consumption	-0.038	0.034	-0.036	0.029	-0.035	0.029
Investment	-0.112	-0.089	-0.104	-0.072	-0.104	-0.072
Hours	0.029	0.006	0.028	-0.027	0.028	-0.027
Wage savers	-0.024	-0.014	-0.022	-0.016	-0.022	-0.016
Wage mortgagors	-0.044	0.043	-0.041	0.038	-0.041	0.038
Wage HtM	0.026	0.090	0.025	0.105	0.025	0.104
Deposits	-0.792	-0.554	-0.743	-0.527	-0.741	-0.526
Loans households	-1.9866	-1.384	-1.864	-1.299	-1.859	-1.296
Loans firms	-0.163	-0.040	-0.152	-0.032	-0.152	-0.032
Rate deposits (bp)	0.0000	0.033	0.0000	0.031	0.0000	0.031
Rate loans househ. (bp)	16.742	10.345	15.686	8.541	15.644	8.529
Rate loans firms. (bp)	14.709	9.406	13.781	7.562	13.744	7.551
Profits (before tax)	5.873	3.626	-1.494	-4.206	-1.490	-4.199
Profits (after tax)	-1.594	-3.684	-1.494	-4.206	-1.490	-4.199
Bank capital	-1.594	-1.047	-1.494	-0.895	-1.490	-0.893
Government revenues	0.096	0.076	0.090	0.063	0.090	0.063

Figures indicate percentage deviations with respect to the initial steady state, except for interest rates which are expressed in basis point deviations and government revenues which represent percent point GDP variation. The permanent increase in banking taxes is design to yield an ex ante increase in government revenues equivalent to 0.1 percentage point GDP in all cases.

Quantitative results

- Taxes on profits, deposits or loans produce changes of a similar magnitude in the main macroeconomic variables.
- Rationality behind this result:
  - The interest rate reaction to deviations from the regulatory capital-to-asset ratio is determined by:

$$(r_t^b - r_t^*) = -\eta_b \left(\frac{k_t^b}{b_t^b} - \nu_b \right) \left(\frac{k_t^b}{b_t^b} \right)^2 .$$

    This expression implies that banks' capital and loans are tied by a constant relationship in the long run and move closely one each other in the short run.

  - The banks' balance sheet constraint:

$$b_t^b = d_t^b - \frac{B_t^*}{\gamma_b} + k_t^b .$$

    The economy starts and ends in our simulations with a net foreign asset position equal to zero. Imposing $B_t^* = 0$ and a constant capital-to-asset ratio (ν_b), the balance sheet constraint can be written as

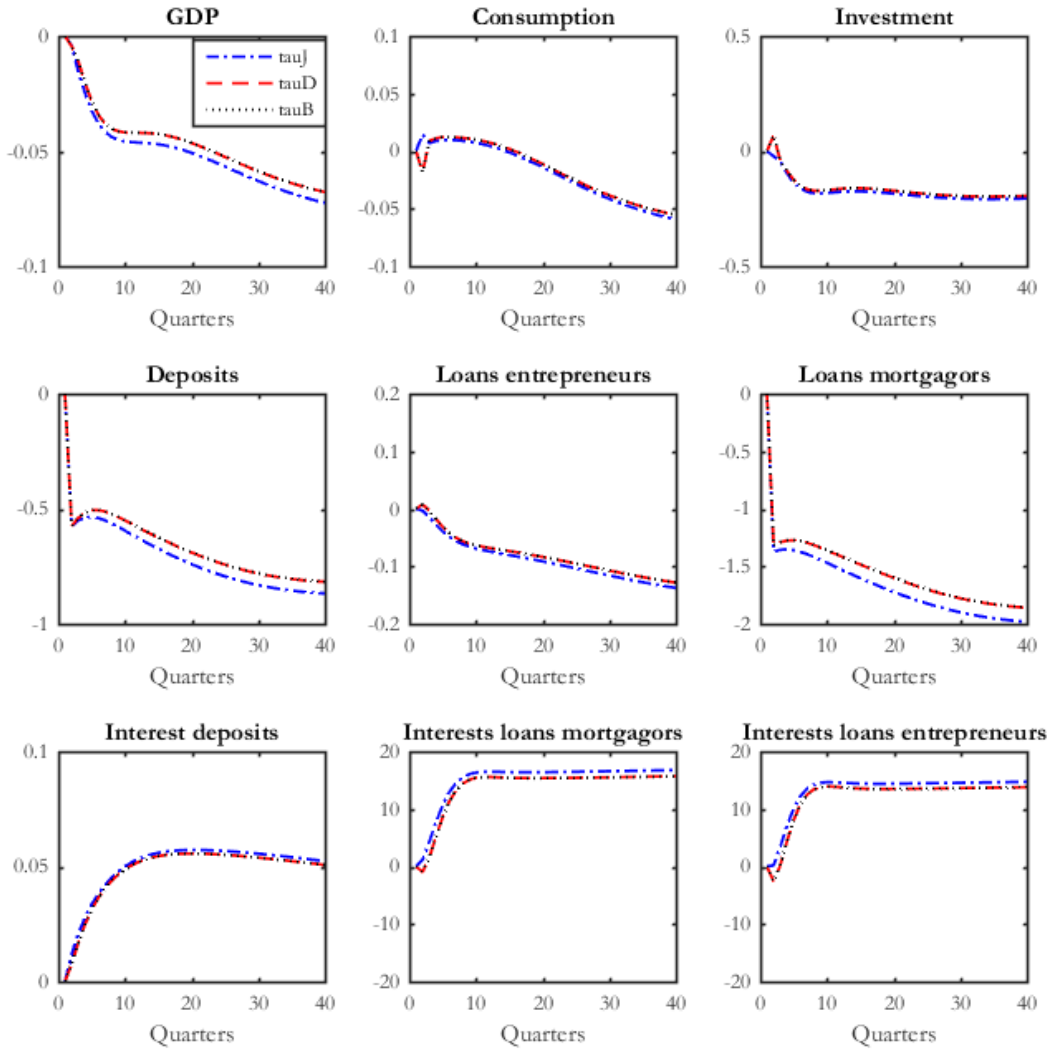
$$d_t^b = (1 - \nu_b)\, b_t^b$$

    Thus, taxing loans or deposits is equivalent when shocks do not provoke important movements in external asset holdings.

Quantitative results

- Long-run results, financial variables:
  - Loans rates increase (between 15 and 17 bp)
  - The stock of credit falls (-0.15 percent to firms and -1.9 percent to households)
  - Deposits also fall (-0.8 percent).
- Long-run results, macroeconomic variables:
  - Aggregate consumption falls (-0.04 percent), but the effects are different for HtM consumers (consumption increases) than for borrowers and lenders (consumption falls)
  - Aggregate investment falls (-0.11 percent)
  - Lenders and borrowers augment working hours (to compensate the fall of consumption), reducing wages in equilibrium.
  - GDP falls 0.083 percent.
  - Although higher taxes on banking provokes a rise in the ex post banks markups that widens the tax base, the decline in real and financial activity causes a slowdown in the potential increase of public revenues.

Quantitative results



Macroeconomic reaction to different taxes

Quantitative results

- In general, negative effects on economic activity increase over time: GDP, private consumption, and investment experience a larger decline in the long run than in the short run.
- The opposite is observed with profits before tax, which expand as banks translate part of the tax burden to households and firms, shrinking their balance sheets and making the credit more expensive, as they attempt to balance their after-tax profitability to the aggregate cost of capital in the rest of the sectors
- Taxes prompt a smooth adjustment in the interest rates on loans that last for ten quarters before stabilizing to the new level (adjustment costs parameters are crucial here)
- Interest rates on deposits are virtually constant over time (given the narrow relationship with the reference rate set by the ECB, that does not change given that it reacts to European inflation)
- Deposits and loans to mortgagors experience a steep decline on impact, before continuing a smoother downturn.
- High persistence of the effect that taxes on banking have on loans and deposits and that translates to consumption and GDP (ten years after the introduction of the tax, aggregate production has not still fully stabilized at its long-run equilibrium)

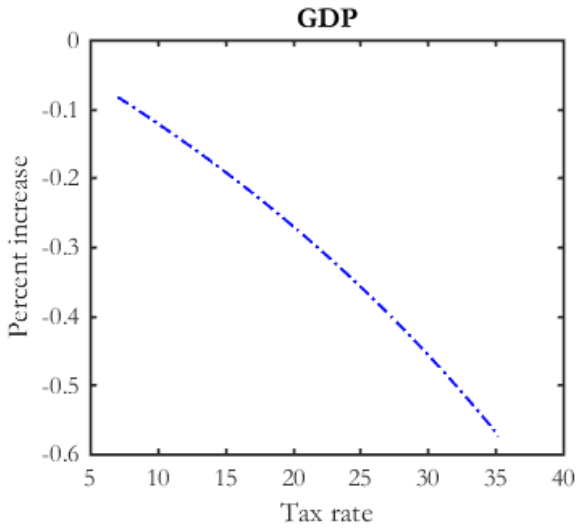
Quantitative results

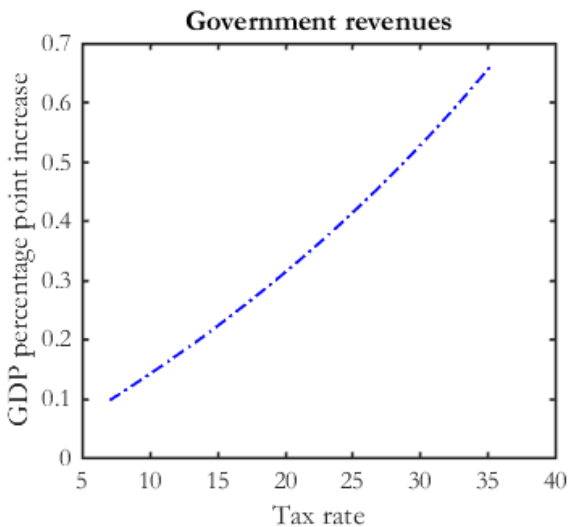
Effects of tax pressure on banks profits:

- One argument in favor of higher taxes on banking activities has to do with increasing the participation of banks in public revenues
- Exercise: let the tax rate on banks' profits to vary between 7 and 35 percentage points (meaning an ex ante government revenue increase between 0.1 and 0.5 GDP percentage point)
- Which is the long-run effect on GDP as percent deviation with respect to the initial equilibrium?
- Which is the long-run effect on government revenues expressed as percentage points of initial GDP?

Quantitative results

Effects of tax pressure on banks profits:





- Government revenues increase slightly more than proportionally with respect to the tax rate
- It comes at a cost of a more than proportionally decline in GDP
- Banks react to taxes by increasing markups and transferring part of the fiscal cost through higher interest rates on loans
- The increase in the tax base (due to higher pre-tax profits) is not fully compensated by the negative effects on the tax base due to lower economic activity
- The trade-off between government revenue and GDP is captured by a multiplier of GDP to government revenues of -0.86, virtually independent of the tax rate

Quantitative results

Robustness checks:

- To check the robustness of the results, we change the value of a set of structural parameters related to banks' behavior and their interaction with other economic agents
- In most of the cases, the simulation results are not very sensitive to changes in the parameter values, despite the large range considered
- Thus, the degree of competition in the banking sector (as capture by the markup parameters), the regulatory capital-to-assets ratio, or the cost of deviating from it, do not change results too much

Quantitative results

SENSITIVITY OF GDP ELASTICITY TO CHANGES IN DIFFERENT PARAMETERS

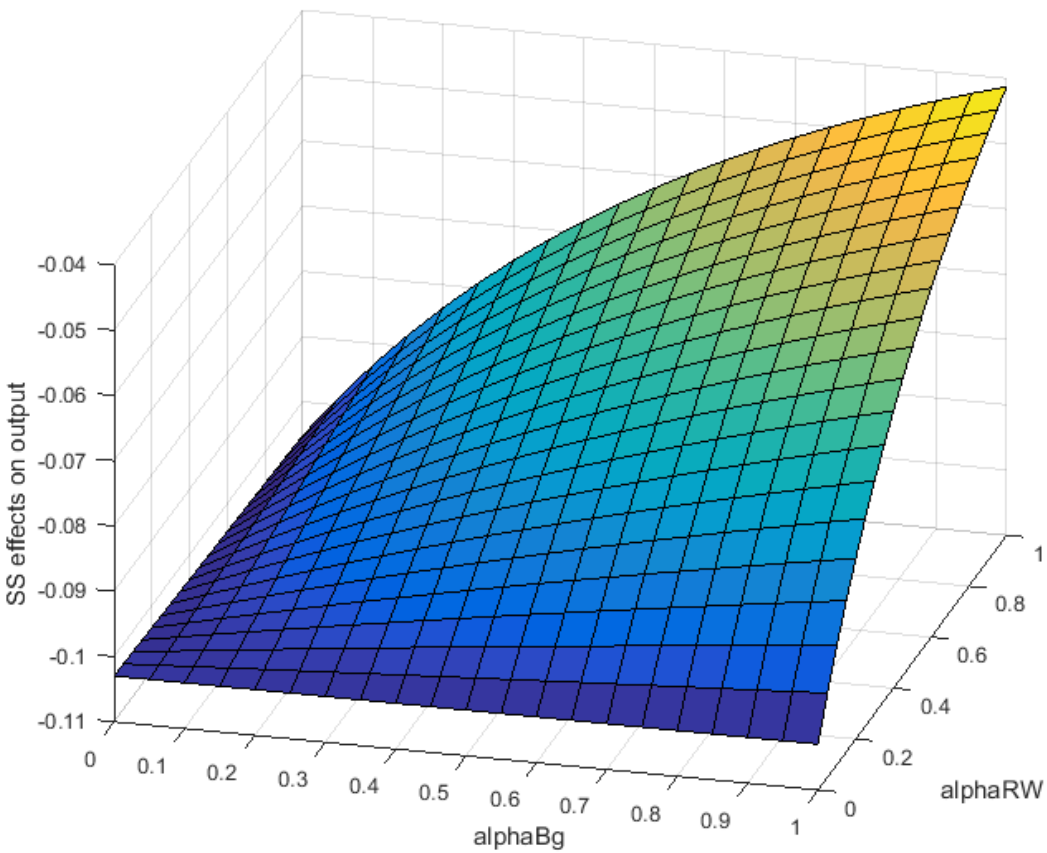
TAX ON BANKS' PROFITS. EFFECTS ON GDP

	Scenario	Parameters	SS	2 years
Baseline			-0.0828	-0.0307
Mortgagors' interest rate markups ($\theta^{bi} = 1.32$)	Low	$\theta^{bi} = 1.15$	-0.0848	-0.0296
	High	$\theta^{bi} = 1.60$	-0.0802	-0.0325
Firms' interest rate markup ($\theta^{bi} = 1.16$)	Low	$\theta^{be} = 1.07$	-0.0806	-0.0301
	High	$\theta^{be} = 1.30$	-0.0861	-0.0313
Deposits' interest rate markdown ($\theta^{d} = 0.61$)	Low	$\theta^{d} = 0.80$	-0.0848	-0.0313
	High	$\theta^{d} = 0.20$	-0.0793	-0.0351
Government interest rate markup ($\theta^{g} = 1.00$)	Low	$\theta^{g} = 1.00$	-0.0828	-0.0307
	High	$\theta^{g} = 1.30$	-0.0795	-0.0303
Interest rate reaction to capital deviation ($\eta_b = 30$)	Low	$\eta_b = 30$	-0.0743	-0.0239
	High	$\eta_b = 120$	-0.0876	-0.0369
Share of retained profits ($\omega_b = 0.8$)	Low	$\omega_b = 0.5$	-0.0820	-0.0253
	High	$\omega_b = 1.0$	-0.0828	-0.0329
Interest rate rigidity ($\eta_d = 2.5$; $\eta_{be} = 9.4$; $\eta_{bi} = 10.1$)	Low	$\eta_d = \eta_{be} = \eta_{bi} = 2$	-0.0828	-0.0304
	High	$\eta_d = \eta_{be} = \eta_{bi} = 500$	-0.0828	-0.0291
Impatientness mortgagors ($\beta_i = 0.98$)	Low	$\beta_i = 0.985$	-0.0776	-0.0250
	High	$\beta_i = 0.95$	-0.1047	-0.0468
Impatientness entrepreneurs ($\beta_e = 0.985$)	Low	$\beta_e = 0.989$	-0.0898	-0.0330
	High	$\beta_e = 0.97$	-0.0639	-0.0245
Utility houses ($a_{hp} = a_{hi} = 0.16$)	Low	$a_{hp} = a_{hi} = 0.10$	-0.1042	-0.0401
	High	$a_{hp} = a_{hi} = 0.26$	-0.0629	-0.0222
Capital/assets ratio ($\nu_b = 0.09$)	Low	$\nu_b = 0.06$	-0.0717	-0.0243
	High	$\nu_b = 0.12$	-0.0894	-0.0358
Capital utilization rate ($u_j = 0.93$)	Low	$u_j = 0.8$	-0.0942	-0.0340
	High	$u_j = 1.0$	-0.0773	-0.0290

Benchmark values of the parameters in brackets

Quantitative results

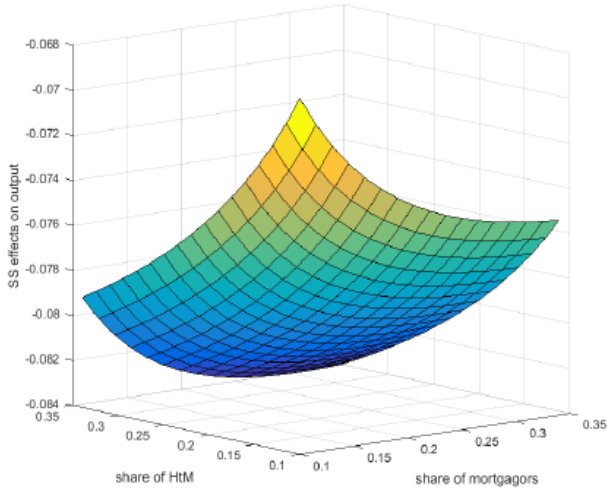
Robustness checks. GDP effect of taxes as a function of bank's government debt holdings:



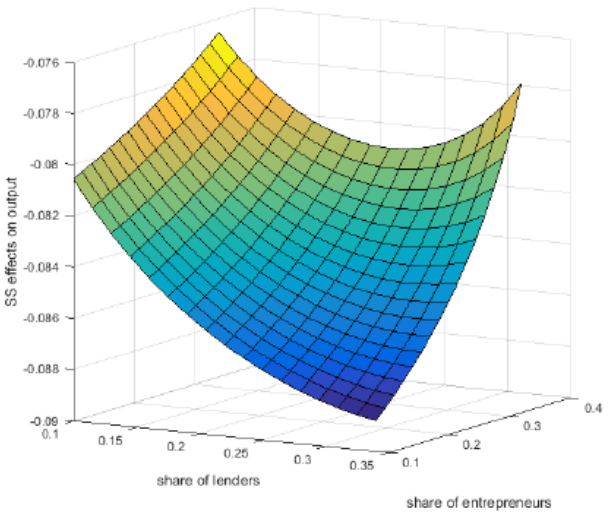
- Simultaneous change of the share of public debt held by residents (α_{RW}) and the share of government debt in resident hands held by banks (α_{Bg})
- Minimum impact when all government debt is held by banks (-0.04 against the benchmark -0.083)
- The increase in government revenues and the subsequent reduction in government debt frees up bank resources that can be readdressed towards mortgagors and entrepreneurs
- The negative effect becomes stronger the higher the amount of government debt held by foreigners.

Quantitative results

Robustness checks. Sensitivity to changes in the population shares of households:



(a) *Share of lenders held constant*



(b) *Share of mortgagors held constant*

- The effect of the banking tax are not very sensitive to changes in the shares of different household types
- The fiscal multiplier of GDP to ex post government revenues ranges between -0.07 and -0.09
- Given a reasonable constant share of lenders, the minimum fiscal multiplier (-0.07) is associated with a low share of impatient and hand-to-mouth households and a high share of entrepreneurs
- The multiplier is greater (-0.09) when the share of impatient households is high and the share of entrepreneurs is low

Conclusions

- The three proposed taxes on banking activity are equivalent in their macroeconomic effects
- In order to maintain the return on capital (net of taxes) in line with the cost of capital of the economy, banks reduce their size in the long run, operating with a smaller volume of capital, credits and deposits, and increase loan interest rates
- Taxes therefore negatively affect real economic activity
- The higher the tax rate the more intensified is the reaction of banks in terms of translating part of the fiscal cost to households and firms
- Although pre-tax bank profits widens with the tax rate, making it possible for government revenues to increase more than proportionately, distortionary effects on the supply side of the economy provoke a more than proportional GDP fall
- The general equilibrium multiplier of GDP to ex post government revenues is close to -0.9, a macroeconomic trade-off that is virtually independent of the tax rate