

Borradores de ECONOMÍA

Relevance of the fiscal-policy setup
in the analysis of macroprudential and
ex-post financial crisis interventions

Por: Julian A. Parra-Polania
Carmina O. Vargas

Núm. 945
2016



tá - Colombia - Bogotá - Colombia - Bogotá - Colombia - Bogotá - Colombia - Bogotá - Colombia - Bogotá - Colombia - Bogotá - Col



Relevance of the fiscal-policy setup in the analysis of macroprudential and ex-post financial crisis interventions

Julian A. Parra-Polania and Carmiña O. Vargas

Abstract

In a previous paper (Parra-Polania and Vargas, 2015) we modify the financial constraint of a very standard model to incorporate the fact that international lenders take into account that taxes (or subsidies) affect borrowers' income available for debt repayments, and find that ex-post interventions are completely ineffective to manage crises (even though they are financed by taxes that do not entail further distortions) and, instead, macroprudential policies are still able to correct the underestimation of the social costs of decentralized debt decisions. These results are obtained under the assumption, also common in the related literature, that there is a balanced-budget fiscal policy. In this paper we extend our previous work to consider countercyclical fiscal policies (keeping the alternative financial constraint). We show that some combination of policy interventions could completely avoid crises, but under restrictive conditions.

Keywords: financial crisis; fiscal policy; credit constraint; macroprudential tax; ex-post policy

JEL Classification: E62, F34, F41, H23, D62

The views expressed in the paper are those of the authors and do not represent those of the Banco de la Republica or its Board of Directors.

Contact e-mails: jparrapo@banrep.gov.co, cvargari@banrep.gov.co

1 Introduction

The crisis of 2008 has brought a renewed interest among academics and policy makers on the benefits of macroprudential and crisis-management policies as a way to mitigate the effects of financial crises, especially in emerging economies. In a recent strand of literature, based on a now common theoretical framework proposed by Mendoza (2002), financial crises have been analyzed in the context of an open economy which faces an occasionally binding financial constraint. The negative effect on welfare stems from the feedback between the presence of this constraint and the underestimation of the social cost of debt.

The standard financial constraint in these models suggests that the individual could borrow up to a proportion of her current income. This can be motivated (e.g. Korinek, 2010) as an incentive compatibility condition that avoids losses for lenders when credit markets are subject to moral hazard problems. If borrowers decided to default, lenders could go to court; however, due to imperfect legal enforcement or the existence of a non-seizable proportion of assets, lenders can recover at most a fraction of borrowers' income, and hence they are unwilling to lend beyond this fraction.

Using this standard constraint, the related literature has shown that ex-ante or macroprudential policies solve the externality problem by increasing the private cost of debt and equalizing it to the social cost (e.g. Korinek, 2010, 2011; Bianchi, 2011). Other papers find that ex-post or crisis-management policies are more effective because they entail larger welfare gains (e.g. Benigno et al., 2013) and even completely avoid crises (e.g. Benigno et al. 2014, 2016) by having a positive effect on the collateral's price and, in turn, increasing debt capacity. Consequently, Benigno et al. (2014, 2016) argue that price support policies welfare dominate the macroprudential ones, especially when all these interventions are costless to use in the sense that they are rebated or financed through lump-sum transfers or taxes (since these do not entail further distortions).

The abovementioned results are found under the assumption that government policies do not modify the configuration of the financial constraint. However, such policies entail imposing taxes or subsidies, altering disposable income and, in the end, debt repayment capacity. For instance, take a subsidy on nontradable consumption financed by a lump-sum tax. The subsidy alters the relative price of nontradable goods, affecting also the value of the collateral. This effect is captured through changes in the value of nontradable income. However, the lump-sum tax reduces debtor's income available for debt repayment, a fact not captured by the standard constraint. By going to court, the lender recovers only a fraction of seizable income, since taxes must be paid to the government.¹

¹It is important to highlight the fact that the financial constraint that we propose assume that taxes must

In a previous paper (Parra-Polania and Vargas, 2015), we analyze financial crises incorporating, into a standard framework, the effect of lump-sum taxes/subsidies on borrowers' debt capacity. Furthermore, we follow common practice and assume that there is a balance-budget fiscal policy. We find that ex-post policies (in particular, a subsidy on nontradable consumption) are utterly ineffective to manage crises while macroprudential policies (e.g. a tax on debt) still correct the externality in a decentralized economy. Although an ex-post intervention increases the price of collateral by subsidizing nontradable consumption, this subsidy is returned by consumers to the government in the form of a lump-sum tax and, consequently, the borrowing capacity remains unaffected. Instead, a macroprudential tax, under the modified financial constraint, still increases the private cost of debt. These results show that there is an instance in which price support policies are costless to use but inoperative. That is the case when the financial constraint depends on disposable income instead of income before taxes. In this case, there is scope for using alternative policy tools, including ex-ante policy interventions, because they welfare dominate costless price support policies.

Benigno et al. (2016, p. 23) acknowledge the fact that, under the alternative constraint, a subsidy on consumption financed through a lump-sum tax is ineffective but show that it is still possible to use ex-post policies to affect the borrowing capacity, although a different (and distortionary) policy tool is required (an ex-post tax on debt). Moreover, under both the standard and the alternative financial constraints, it is actually possible, in theory, to avoid crises and reach the never-constrained allocation using a combination of taxes and subsidies on debt and (tradable and nontradable) consumption. However, although effective in theory, it seems difficult in practice to use debt of a specific period to increase the borrowing capacity on which that same debt depends. For these reasons, we argue that for practical purposes it could be better to consider other fiscal policy setups.

We extend our previous work to consider countercyclical fiscal policies and show that (keeping the alternative financial constraint) some combination of policy interventions could even completely avoid crises but under restrictive conditions. Since subsidies/transfers during crises have to be financed by resources previously accumulated by taxes, there is a limit to the amount that can be subsidized, i.e. it is possible that there are not enough resources to take the economy out of the crisis. Furthermore, taxes implemented during normal times may reduce debt capacity and hence the policymaker should avoid imposing taxes so large that the economy would become financially constrained.

be paid to the government. Benigno et al. (2016, footnote 6) refer to this alternative financial constraint as the one in which individuals "can default on their tax obligation" and to the standard constraint as that in which the individuals are "left with their full tax-obligation". It is actually the opposite: in the constraint that we propose lenders take into account that even if they go to court they will recover only a fraction of income after (rather than before) taxes, i.e. tax obligations take precedence over lenders.

2 The Model

We use a standard theoretical framework. A continuum of mass one of identical households maximize the utility function

$$U = E_1 \left[\sum_{t=1}^{\infty} \beta^t u(C_t) \right] \quad (1)$$

where β is the discount factor, $u(\cdot)$ is the period utility function and C_t is the consumption index which aggregates tradable (T) and nontradable (N) goods

$$C_t = C(C_t^T, C_t^N) \quad (2)$$

Every period, each household receives a stochastic bundle of tradable and nontradable goods, Y_t^T and Y_t^N , and has access to international financial markets through one-period loans B_{t+1} ($B_{t+1} < 0$ implies savings) at an interest rate r ($R \equiv 1 + r$). The budget constraint, in units of tradable goods, is:

$$C_t^T + P_t^N C_t^N + R B_t = Y_t^T + P_t^N Y_t^N + B_{t+1} \quad (3)$$

where P_t^N is the price of nontradables and the price of tradables has been normalized to one. $1/P_t^N$ may be interpreted as the real exchange rate.

An economy described by Equations (1)-(3) is not subject to a credit constraint. We identify this as a ‘never-constrained’ economy.

The standard financial constraint widely used in the literature, which depends on current income, is as follows

$$B_{t+1} \leq \kappa (Y_t^T + P_t^N Y_t^N) \quad (4)$$

As in the related literature, we interpret constrained periods as ‘crisis’ periods.

More details (e.g. first order conditions) on the solution of the never-constrained and the constrained model can be found in Parra-Polania and Vargas (2015).

3 Previous Results (balanced-budget fiscal policy)

Proofs and more details about the propositions in this section can be found in Parra-Polania and Vargas (2015).

3.1 Ex-post policy

Suppose the government imposes a subsidy $\tau_t > 0$ on nontradable consumption (effective only when, in the absence of it, there would be crisis), which is returned by the household through

a lump-sum tax $T_t > 0$. Similarly to Benigno et al. (2014, 2016), we may interpret this policy as an exchange rate intervention.

The new budget constraint is

$$C_t^T + P_t^N (1 - \tau_t) C_t^N + RB_t = Y_t^T + P_t^N Y_t^N - T_t + B_{t+1} \quad (5)$$

As standard in the related literature, we assume that there is a balanced-budget fiscal policy every period:

$$T_t = \tau_t P_t^N C_t^N \quad (6)$$

It can be shown that τ_t allows the government to achieve the never-constrained allocation:

Proposition 1 *If there exists a solution for a never-constrained economy described by Equations (1)-(3), then for an economy with financial constraint described by Equations (1), (2), (4), (5) and (6) there exists a minimum value of $\tau_t \in (0, 1)$, for every t , such that the economy achieves the never-constrained allocation.*

In this case the government can boundlessly increase the economy's borrowing capacity. This analysis implicitly assumes that lenders overlook that households have to pay lump-sum taxes, which affect their debt repayment capacity. If, instead, lenders incorporate this fact, the constraint should depend on disposable (rather than total) income:

$$B_{t+1} \leq \kappa (Y_t^T + P_t^N Y_t^N - T_t) \quad (7)$$

Under constraint (7), the ex-post intervention is completely ineffective:

Proposition 2 *In the economy described by Equations (1), (2), (5), (6) and (7), a subsidy on nontradable consumption τ_t has no impact on the equilibrium values of C_t^T , μ_t , λ_t and B_{t+1} .*

With the financial constraint being (7), and under a balanced-budget fiscal policy, a subsidy on consumption financed by a lump-sum tax not only cannot avoid crises but also leaves completely unaltered the constrained economy. This result shows that there is an instance in which price support policies are costless to use but inoperative.

Benigno et al. (2016, p.23) acknowledge the fact that this ex-post policy does not work under the alternative constraint but show that it is still possible to affect the borrowing capacity using a different policy tool: an ex-post tax on debt ($\omega_t > 0$) that finances a lump-sum transfer ($S_t > 0$). In this case (we follow their appendix A.7.2 but keep our own notation) the borrowing capacity is increased by the lump-sum transfer and, since there is a balanced budget ($S_t = \omega_t B_{t+1}$), the financial constraint can be rewritten as follows:

$$B_{t+1} \leq \kappa (Y_t^T + P_t^N Y_t^N + \omega_t B_{t+1})$$

However, it must be remarked that this is not a costless policy since the borrowing capacity is increased by means of a distortionary tax on debt, and hence debt and consumption decisions are affected and can be different from those in the never-constrained economy.

Maybe more interesting for the discussion about the effectiveness of an ex-post policy under the alternative constraint, Benigno et al. (2016, appendix A.6.2) show that using three distortionary policies (taxes/subsidies on debt, tradable consumption and nontradable consumption), it is possible to relax the borrowing constraint and to replicate the unconstrained solution.² This result is obtained under the standard financial constraint; however, since there are no lump-sum transfers/taxes in this setup, the standard and the alternative constraints are equivalent.

The foregoing results are theoretical; nevertheless, implementation issues should be considered for practical purposes: it seems rather difficult to use debt of a specific period to increase the borrowing capacity on which that same debt depends. As borrowing capacity is assessed before the loan is disbursed, this actually seems unfeasible.

Given these reasons, we consider that it could be better to consider other fiscal policy setups. In particular, we consider countercyclical fiscal policy below in Section 4.

3.2 Macro-prudential Policy

Since private agents have an insignificant impact on the market, they take prices as given. Instead, a benevolent Social Planner (SP) subject to the same financial constraint internalizes the effect of borrowing decisions on prices. Previous literature (e.g. Bianchi, 2011; Korinek, 2011) shows that the SP improves social well-being by choosing a lower level of debt, reducing the future need for debt and therefore mitigating the negative amplification effects of previous debt on the economy under crisis. The SP equilibrium can be implemented in a decentralized economy using a macro-prudential (i.e. triggered in normal times only) tax on debt.

Suppose that in the decentralized economy the government imposes a macroprudential tax $\omega_t > 0$ on debt ($\omega_t = 0$, when the economy is constrained), which is returned to the household through a lump-sum transfer S_t . The budget constraint in financially unconstrained periods is

$$C_t^T + P_t^N C_t^N + R B_t = Y_t^T + P_t^N Y_t^N + S_t + B_{t+1} (1 - \omega_t) \quad (8)$$

Again we assume that, as standard in the related literature, there is a balanced-budget fiscal

²As shown in Proposition 1, there is always a minimum subsidy that implements the never-constrained allocation the case of the subsidy on nontradable consumption financed by a lump-sum tax (under the standard constraint). In the case of the three distortionary policies some other restrictive conditions may apply. In particular, since these policies are effective in crisis periods only (in normal periods taxes/subsidies are zero) and there is uncertainty on future income, the expectation of the future tax/subsidy on tradable consumption is different from its actual value and solving for the latter may require imposing further conditions (it seems that Benigno et al. 2014, appendix A.6.2, assume that taxes and subsidies are imposed every period -as if all were crisis periods- and that $\tau_{t+1}^T = E_t \tau_{t+1}^T$ -where τ_t^T is the tax on tradable consumption-)

policy every period:

$$S_t = \omega_t B_{t+1} \tag{9}$$

If the standard financial constraint is used, the following proposition applies

Proposition 3 *In the economy described by Equations (1), (2), (4), (8) and (9) the SP allocation is implemented in the decentralized economy by imposing a macroprudential tax (ω_t) on debt satisfying*

$$\omega_t = \frac{\beta RE_t [\lambda_{t+1} \psi_{t+1}] - \lambda_t \psi_t}{u'(C_t) \frac{\partial C_t}{\partial C_t^T}} \tag{10}$$

Unlike the result on ex-post policy, which becomes utterly ineffective under the alternative financial constraint (Proposition 2), the ex-ante policy preserves its ability to correct the externality even when lenders consider the effect of taxes on income available for debt repayment:

Proposition 4 *In the economy described by Equations (1), (2), (7), (8) and (9), a macroprudential tax that satisfies (10) implements the SP allocation in the decentralized economy.*

4 Countercyclical Fiscal Policy

So far we have considered a balanced-budget fiscal policy as is standard in the literature. In this section, instead, we discuss how a countercyclical setup may affect our results. We work under the assumption that the appropriate financial constraint is of the form (7).

4.1 Subsidy on nontradable consumption

Let us assume the government creates a stabilization fund which is used to save in good times and to spend in bad times so as to mitigate the impact of crises. For the case of the ex-post policy, the dynamic of the fund (F_t) is as follows:

$$F_t = F_{t-1} - \tau_t P_t^N Y_t^N + T_t, \quad F_t \geq 0 \tag{11}$$

where τ_t corresponds to a subsidy on nontradable consumption and T_t to a lump-sum tax. The latter finances the former but they are implemented in different periods: the tax is imposed during normal times and the subsidy is used in those periods in which it is needed to mitigate the crisis or, if possible, to avoid it. Consequently, when $\tau_t \neq 0$, $T_t = 0$ and vice versa.

We show below that under this countercyclical fiscal policy, the result obtained in Proposition 2 does not apply to the setup with a financial constraint of the form (7), and therefore the subsidy τ_t has impact on the equilibrium. However, this does not imply that the subsidy may

always avoid crises, unlike what happens in Proposition 1 (with the standard financial constraint). Some restrictive conditions must be satisfied for the subsidy to be able to completely avoid crises.

Since during (potential) crises there is a subsidy ($\tau_t > 0$) but no tax ($T_t = 0$), the financial constraint (7) is equivalent to the standard one (Equation 4). The minimum subsidy $\tilde{\tau}_t$ necessary so that the government avoids the crisis in a specific period t ensures that

$$B_{t+1} = \kappa (Y_t^T + P_t^N Y_t^N) \quad (12)$$

In addition, to reach the never-constrained level of tradable consumption (C_t^{T*}) debt must be (from Equation 5)

$$B_{t+1} = C_t^{T*} - \tau_t P_t^N Y_t^N + RB_t - Y_t^T \quad (13)$$

Using (12) and (13), the minimum subsidy to achieve the never-constrained consumption is

$$\tilde{\tau}_t = \frac{C_t^{T*} + RB_t - Y_t^T - \kappa \left(Y_t^T + Y_t^N \left[\frac{\partial C_t^* / \partial C_t^N}{\partial C_t^* / \partial C_t^{T*}} \right]_{C_t^N = Y_t^N} \right)}{C_t^{T*} + RB_t - Y_t^T - \kappa Y_t^T + Y_t^N \left[\frac{\partial C_t^* / \partial C_t^N}{\partial C_t^* / \partial C_t^{T*}} \right]_{C_t^N = Y_t^N}} \quad (14)$$

The numerator is the difference between the desired level of debt and the maximum that can be obtained (both in the absence of the subsidy). Both the numerator and the denominator are positive and the latter is greater than the former, hence $\tilde{\tau}_t \in (0, 1)$. Thus any subsidy $\tau_t \in (\tilde{\tau}_t, 1)$ would allow the economy to achieve the unconstrained allocation. Since this subsidy is financed by the fund F_t , rather than from a tax imposed in the same period, there is a limit to the amount of resources that can be used for this purpose ($F_t \geq 0$) which implies, from Equation (11) and the fact that $P_t^N = \frac{1}{1-\tau_t} \left[\frac{\partial C_t^* / \partial C_t^N}{\partial C_t^* / \partial C_t^{T*}} \right]_{C_t^N = Y_t^N}$, that³

$$\tau_t \leq \frac{F_{t-1}}{F_{t-1} + Y_t^N \left[\frac{\partial C_t^* / \partial C_t^N}{\partial C_t^* / \partial C_t^{T*}} \right]_{C_t^N = Y_t^N}} \equiv \hat{\tau}_t$$

As a result, by implementing any τ_t that satisfies $\tilde{\tau}_t \leq \tau_t \leq \hat{\tau}_t$ it is possible to avoid crises. However, under some conditions (e.g. there are not sufficient resources in the fund because the crisis is unexpectedly large or long) $\hat{\tau}_t < \tilde{\tau}_t$, in which case there is no subsidy that could take the economy out of the crisis.

Furthermore, since taxes ($T_t > 0$) are imposed during normal times, they reduce the economy's debt capacity. If too large, they could make the economy financially constrained. Therefore, to completely avoid crises the following condition must also be satisfied during

³In addition to the condition $F_t \geq 0$ for each period, it should be true that for an infinite horizon: $\sum_{t=0}^{\infty} \tau_t P_t^N Y_t^N = \sum_{t=0}^{\infty} T_t$.

normal times:

$$T_t \leq \frac{\kappa (Y_t^T + P_t^N Y_t^N) - RB_t - C_t^{T*} + Y_t^T}{1 + \kappa}$$

4.2 Three distortionary policy tools

A similar analysis can be done for the combination of three distortionary policies. In this case we use a subsidy on nontradable consumption to mitigate, or avoid, crises. This subsidy is financed by resources accumulated during normal periods by means of an appropriate combination of taxes/subsidies on debt and tradable consumption. The dynamic of the fund in this case is represented by

$$F_t = F_{t-1} - \tau_t P_t^N Y_t^N + \omega_t B_{t+1} + \tau_t^T C_t^T, \quad F_t \geq 0 \quad (15)$$

where τ_t is the subsidy on nontradable consumption and ω_t and τ_t^T are taxes/subsidies on debt and tradable consumption, respectively. When $\tau_t \neq 0$, $\omega_t, \tau_t^T = 0$ and vice versa. As we illustrate with an example below, ω_t and τ_t^T may be both positive (taxes) or one of them may be negative (a subsidy).⁴

For (potential) crisis periods, the analysis is the same as that in Section 4.1 and Equation (14) is the expression for the minimum subsidy required to achieve the never-constrained level of consumption.

Additionally, during normal times the taxes/subsidies on debt and tradable consumption must satisfy some conditions: (i) they should not make the economy financially constrained, (ii) they are limited by available resources in the fund and (iii) they should not distort the decision on consumption. It is easy to see that conditions (i) and (ii) imply, respectively:

$$B_{t+1} \leq \kappa \left(Y_t^T + (1 + \tau_t^T) Y_t^N \left[\frac{\partial C_t^* / \partial C_t^N}{\partial C_t^* / \partial C_t^{T*}} \right]_{C_t^N = Y_t^N} \right) \quad (16)$$

$$\omega_t B_{t+1} + \tau_t^T C_t^{T*} \geq -F_{t-1} \quad (17)$$

To obtain an expression for condition (iii) we use the first order conditions of the household problem (see Parra-Polania and Vargas, 2015), incorporating the effect of taxes/subsidies. Such conditions imply that

$$\frac{1 - \omega_t}{1 + \tau_t^T} \left[u'(C_t) \frac{\partial C_t}{\partial C_t^T} \right]_{C_t^N = Y_t^N} = \beta RE_t \frac{\left[u'(C_{t+1}) \frac{\partial C_{t+1}}{\partial C_{t+1}^T} \right]_{C_{t+1}^N = Y_{t+1}^N}}{1 + \tau_{t+1}^T} \quad (18)$$

⁴The same applies to the analysis of three distortionary policies with a balanced-budget fiscal policy (presented by Benigno et al., 2016).

and for the never-constrained economy the same condition is

$$\left[u' (C_t^*) \frac{\partial C_t^*}{\partial C_t^{T*}} \right]_{C_t^N = Y_t^N} = \beta RE_t \left[u' (C_{t+1}^*) \frac{\partial C_{t+1}^*}{\partial C_{t+1}^{T*}} \right]_{C_{t+1}^N = Y_{t+1}^N} \quad (19)$$

From Equations (18) and (19) we infer that condition (iii) can be formally expressed as

$$\frac{1 - \omega_t}{1 + \tau_t^T} = \frac{1}{1 + E_t \tau_{t+1}^T} \quad (20)$$

Equations (16), (17) and (20) impose restrictive conditions to the possibility of achieving the never-constrained consumption. Let us illustrate such restrictions by means of a specific case.

Assume that, during a normal period, there is certainty about the fact that the next period there would be crisis in the absence of interventions. This implies that $E_t \tau_{t+1}^T = 0$ (also $E_t \omega_{t+1} = 0$). To satisfy (20) it is required that $\omega_t = -\tau_t^T$, i.e. one of them must be a subsidy.⁵ Suppose $\omega_t < 0$, i.e. there is a subsidy on debt and, consequently, a tax on tradable consumption $\tau_t^T > 0$. Since we are in a normal period, it should be true that in the absence of intervention ($\tau_t^T = 0, \omega_t = 0$), $B_{t+1} = C_t^{T*} + RB_t - Y_t^T \leq \kappa \left(Y_t^T + \left[\frac{\partial C_t^* / \partial C_t^N}{\partial C_t^* / \partial C_t^{T*}} \right]_{C_t^N = Y_t^N} Y_t^N \right)$ and hence, incorporating the effect of the intervention, Equation (16) is also satisfied.⁶

$$B_{t+1} = C_t^{T*} + \frac{RB_t - Y_t^T}{1 + \tau_t^T} \leq \kappa \left(Y_t^T + (1 + \tau_t^T) Y_t^N \left[\frac{\partial C_t^* / \partial C_t^N}{\partial C_t^* / \partial C_t^{T*}} \right]_{C_t^N = Y_t^N} \right)$$

We still need to satisfy Equation (17). It requires that $\tau_t^T (C_t^{T*} - B_{t+1}) \geq -F_{t-1}$, which implies that $RB_t - Y_t^T \leq \frac{1 + \tau_t^T}{\tau_t^T} F_{t-1}$. In this particular case, if the previous debt is too high or the resources previously accumulated are too low there will not be a combination of the three policy tools able to satisfy Equations (16), (17) and (20).

5 Conclusion

In a previous paper (Parra-Polania and Vargas, 2015) we modify the financial constraint of a very standard model, to incorporate the fact that international lenders take into account that taxes (or subsidies) affect borrowers' income available for debt repayments, and find that ex-post interventions are completely ineffective to manage crises and, instead, macroprudential policies are still able to correct the underestimation of the social costs of decentralized debt decisions. These results are obtained under the assumption, also common in the related

⁵If $E_t \tau_{t+1}^T$ were positive and large enough, both ω_t and τ_t^T could be positive (taxes).

⁶Take into account that (from the budget constraint) $B_{t+1} = C_t^{T*} + RB_t - Y_t^T + \omega_t B_{t+1} + \tau_t^T C_t^{T*}$ and that $\omega_t = -\tau_t^T$

literature, that there is a balanced-budget fiscal policy.

In this paper we extend our previous work to consider countercyclical fiscal policies (keeping the alternative financial constraint). We show that some combination of policy interventions could completely avoid crises, but under restrictive conditions. Since subsidies/transfers during crises have to be financed by resources previously accumulated, there is a limit to the amount that can be subsidized, and taxes implemented during normal times should be small enough to avoid making the economy financially constrained.

References

Benigno, G., Chen, H., Otrok, C., Rebucci, A., Young, E., 2013. "Financial crises and macro-prudential policies," *Journal of International Economics*, vol. 89 pp.453–470.

Benigno, G., Chen, H., Otrok, C., Rebucci, A., Young, E., 2014. "Optimal Capital Controls and Real Exchange Rate Policies: A Pecuniary Externality Perspective," CEPR Discussion Papers, No. 9936.

Benigno, G., Chen, H., Otrok, C., Rebucci, A., Young, E., 2016. "Optimal Capital Controls and Real Exchange Rate Policies: A Pecuniary Externality Perspective," NBER Working Papers, No. 22224.

Bianchi, J., 2011. "Overborrowing and Systemic Externalities in the Business Cycle," *American Economic Review*, vol. 101(7), American Economic Association, pp. 3400-3426.

Korinek, A., 2010. "Regulating Capital Flows to Emerging Markets: An Externality View," Available at SSRN: <http://ssrn.com/abstract=1330897>.

Korinek, A., 2011. "The New Economics of Prudential Capital Controls: A Research Agenda." *IMF Economic Review*, vol. 59(3), Palgrave Macmillan Journals, pp. 523-561.

Mendoza, E., 2002. "Credit, prices, and crashes: business cycles with a sudden stop." In: Edwards, S., Frankel, J.A. (Eds.), *Preventing Currency Crises in Emerging Markets*. University of Chicago Press and National Bureau of Economic Research, Chicago, United States.

Parra-Polania, J., Vargas, C., 2015. "Macroprudential vs. Ex-post Policy Interventions: when Domestic Taxes are Relevant for International Lenders," *Borradores de Economía* No. 879. Banco de la República de Colombia.

